Instruction

MI 611-224
August 2009

Model 875EC
Intelligent Electrochemical Analyzer
for
Electrodeless Conductivity Measurements

FOXBORO™

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1. Introduction

The 875EC Electrodeless Conductivity Analyzer is one of a family of line-powered analyzers. It receives conductivity measurements from a measuring sensor and provides that information via a front panel display, integral dual analog (4 to 20 mA) outputs, an optional digital communication port, and dual alarm outputs.

The analyzer is available in panel, pipe, and surface mounted versions. The panel mounted version is rated NEMA Type 1. However, the front panel meets NEMA Type 4X requirements when mounted in a panel and gasketed in place with a Invensys Process Systems (IPS) supplied gasket and mounting bracket. The pipe and surface mounted versions are dusttight and weatherproof, as defined by IEC IP65, and provide the environmental and corrosion resistant protection of NEMA Type 4X. The 875EC Analyzers are also designed to meet the electrical safety requirements of major testing laboratories.

The integral display consists of 240 x 128 pixel backlighted Liquid Crystal Display (LCD). Various combinations of pixels create the text and symbols for the entire front panel operating modes.

⚠ WARNING

If your analyzer is used in a manner not specified by IPS, the fire and electrical shock protection provided by the analyzer may be impaired.

Reference Documents

The following documents provide additional and related information.

Document[(a)]	Description
DP 611-164	Dimensional Print - 875 Electrochemical Analyzers
MI 611-206	FM, CSA, and IEC Intrinsically Safe Connector Diagrams and Nonincendive Circuits
MI 611-208[(b)]	Electrochemical Products Safety Information (for European installations)
MI 611-220	Instruction - System Calibration Examples
MI 611-226	Instruction - 875 Remote Communication Program
PL 611-163	Parts List - 875EC Electrochemical Analyzers, Style C

(a) Documents are available on line at **www.ips.invensys.com** (pull down **Products** menu and select **Measurement & Instruments,** then **Analytical**, then **Electrodeless Conductivity,** then **Documentation**, then **Specs, Instructions, Drawings, Parts**).

(b) Available in many languages on line at **www.ips.invensys.com** (pull down **Products** menu and select **Measurement & Instruments,** then **Downloads**, then **Safety Instructions for Analytical**).

Factory Default Passcode

The factory default passcode for all three levels of passcode is **0800**.

2. Quick Start

The purpose of this section is to:

- Help you to wire your analyzer
- Familiarize you with the instrument configuration as received from the factory
- Explain normal operation in Measure mode.

Wiring

Connections to your 875EC panel mounted instrument are located on the rear of the housing; those of your field mounted (pipe or surface mounted) instrument are located in the lower compartment. Access to the field mounted instrument connection terminals are via openings in the bottom of the enclosure. Make your sensor connections to the top terminal strip and ac power, analog output, alarm output, and digital I/O connections to the lower terminal strip per Figure 1.

⚠ WARNING

Wiring installation must comply with any existing local regulations.

⚠ CAUTION

Your analyzer was made to accept a certain supply voltage. Check the data plate on the transmitter cover for correct supply voltage before wiring.

NOTE

Refer to MI 611-206 for FM, CSA, and IEC wiring requirements.
Refer to MI 611-208 for European (ATEX) safety information

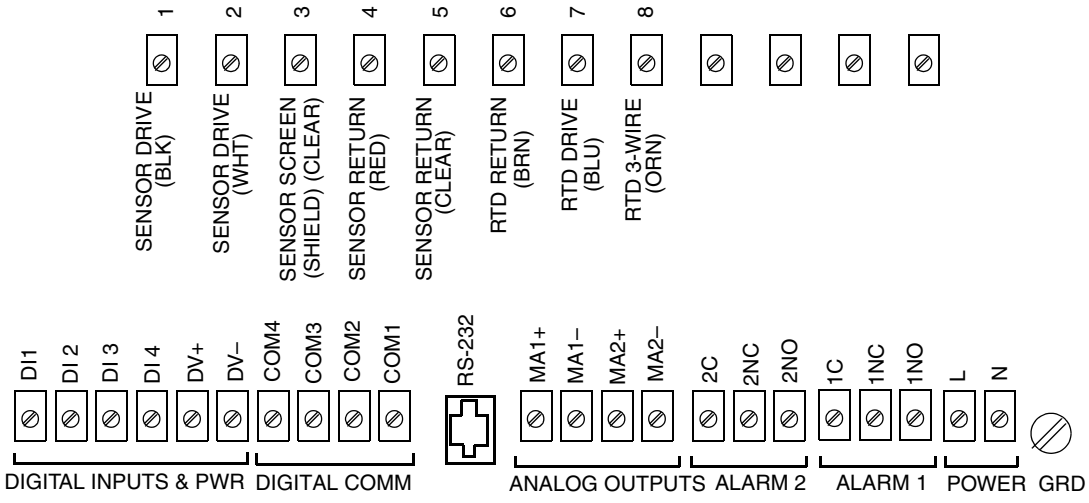


Figure 1. Wiring Connections for 875EC (Style C) Analyzer

NOTE

1. The ground connection on Style C panel mounted analyzers is located as shown above. The ground connection on Style C field mounted analyzers is on a case boss just below the power connections.
2. The ground connection for Style A and B analyzers is shown in Figure 7.

Checking Factory Configuration

Following the structure diagrams in Appendix A on page 83 and using the arrow keys, you can step through the product structure as configured in the factory. The factory default values are listed in Appendix B on page 97. In the table that comprises Appendix B, there is a column provided to make any notations you wish about your specific configuration.

NOTE

The factory default passcode for all three levels of passcode is **0800**.

Calibration

After wiring your analyzer and checking/changing the configuration, you should perform a **2 Point** calibration. To enter the Calibration mode, press the **Mode** key until the **Cal** indicator is illuminated. Press **Enter**. At the prompt, enter the passcode and press **Enter**. Next, enter the calibrator's name and press **Enter**. The analyzer displays **Sensor**, the first category in the top level calibration structure. Press **Enter**. The display changes to **Solution**. Press **Enter** again. Use the **Down** arrow key to select **2 Point** and press **Enter**. Follow the prompts to calibrate your analyzer.

Basic Operation in Measure Mode

Measure is the normal operating mode of your analyzer. It is indicated by an illuminated **Measure** indicator. When the display is configured for single line measurements or scanning measurements, the measurement title, value, and unit are displayed. For single line measurements, a bar graph showing the percentage of a configured measurement range is also displayed. When configured for dual line measurements, the measurement title, value, and unit for each line is displayed. A bar graph showing the percentage of the Line 1 configured measurement range is also displayed. Any measurement can be temporarily scrolled onto the display by using the **Up** and **Down** arrow keys. These user-selected measurements show the measurement title, units, and value. During the display of these user-selected measurements, the bargraph is inactive. You can return to the configured selection by using the **Up** and **Down** arrow keys. The display automatically returns to the configured selection when the configured Timeout time is reached. Fault messages are also shown on your display while in the Measure mode. Alarm status is shown by two alarm indicator lamps.

Looking for More Information?

For more detailed information, refer to the following sections of this manual:

- For installation information, refer to “Installation” on page 11.
- For detailed explanation of the controls and indicators, refer to “Controls and Indicators” on page 21.
- For detailed calibration instructions, refer to “Calibration Mode” on page 34.
- For detailed configuration instructions, refer to “Configuration Mode” on page 41.

For dimensional information, refer to DP 611-164.

If you need additional help, contact the IPS Global Client Support Center at 1-866-746-6477 or contact your local IPS representative.

3. Specifications

Operating, Storage, and Transportation Conditions

Table 1. Operating, Storage, and Transportation Conditions

Influence	Reference Operating Conditions	Normal Operating Condition Limits	Operative Limits	Storage and Transportation Limits
Ambient Temperature	23±2°C (73±4°F)	-10 and +65°C (14 and 149°F)	-20 and +75°C (-4 and +167°F) [a]	-40 and +85°C (-40 and +185°F)
Relative Humidity	50±10%	5 and 95% Noncondensing	5 and 95% Noncondensing	5 and 95% Noncondensing
Supply Voltage	Rated Voltage [b] ±1%	Rated Voltage [b] -15 and +10%	Rated Voltage [b] -20 and +15%	Not Applicable
Supply Frequency	50 or 60 Hz, ±1%	50 or 60 Hz, ±3%	50 or 60 Hz, ±3%	Not Applicable
Vibration Field Mount Panel Mount	1 “g” (10 m/s2) between a frequency or 5 and 200 Hz 0.25 “g” (2.5 m/s2) between a frequency or 5 and 200 Hz			Note (c)
Mounting Position	Generally Upright	Any Position	Any Position	Not Applicable

(a) -20 and +60°C (-4 and +140°F) for analyzers with ATEX and IEC certification.

(b) Rated voltage is 24, 100, 120, 220, or 240, V ac, or 24 V dc.

(c) During transportation, the packaged analyzer can withstand normal shipping and handling conditions without damage.

Functional and Physical Specifications

Supported Sensors:

The 875EC Analyzer is used with 871EC and 871FT Series Conductivity Sensors. Contact IPS for limitations and procedures with other electrically compatible sensors.

Minimum Output Span: 5% of full scale

Maximum Output Span: 500% of full scale

Isolated Output Load: 800 ohms maximum

Temperature Compensation Inputs:

100 ohm platinum RTD (2 or 3 wire)
100 ohm platinum RTD (3 wire) MIL-T-24388C (SH)
1000 ohm platinum RTD (2 or 3 wire)
100 kilohm thermistor

Power Consumption: 17 Watts maximum

Alarm Contacts: Form C rated 5 A at 250 V ac, 2 A at 30 V dc, noninductive. The ATEX and IEC limits are 5 A at 160 V ac and 2 A at 30 V dc.

Digital Inputs/Outputs

Terminal DV+ Power: 4.5 V ±3% at 10 mA maximum (provided by the analyzer)

Terminal DV- Power: -20 V +1% at 10 mA maximum (provided by the analyzer)

Inputs DI1 - DI4 (only used with the +4.5 V/-20 V outputs provided by the analyzer):

High Logic: User must ensure voltage to be between 2.7 and 10 V

Low Logic: User must ensure circuit to be open or less than 0.8 V

Data Storage:

Configuration, calibration, and operating parameters are stored in nonvolatile memory for >5 years.

Remote Configuration:

Via RS-232 communication. The interface contains three signal lines (RXD, TXD, GND). The cable, connecting the computer to the analyzer, that is part of the optional configurator utility kit is 3 m (10 ft). This distance can be extended to 15 m (50 ft) with an extension cable. It can be further extended with the use of a user-supplied modem.

Optional Digital Communication Interfaces: HART

Maximum Recommended Distance Between Sensor and Analyzer: 33 m (100 ft)

Mounting: Panel, Pipe, or Surface mounting per model code

Enclosure:

Panel Mounting: The basic housing meets NEMA 1 requirements for general purpose, indoor applications. However, when properly installed in a panel per Figure 4 on page 13, the front surface provides the environmental and corrosion resistant protection of NEMA Type 4X, CSA Enclosure 4X, and IEC IP65.

Field (pipe or surface) Mounting: The enclosure provides the environmental and corrosion resistant protection of NEMA Type 4X, CSA Enclosure 4X, and IEC IP65.

Weight (approximate):

Panel Mounted: 1.8 kg (4.0 lb)
Pipe or Surface Mounted: 3.3 kg (7.3 lb)

European Union and International Directives:

Complies with the Electromagnetic Compatibility Requirements of European EMC Directive 89/336/EEC by conforming to the CENELEC and IEC Standards as follows:

- Field Mount: EN50081-2 and EN50082-2. Also complies with NAMUR Part 1 Interference Immunity Requirement (Germany version of EN50081-2 and EN50082-2)
- Panel Mount: EN61326, ANNEX A.

Both Field Mounted and Panel Mounted analyzers comply and conform to Applicable European Union Directives (“CE” marking on product).

Pollution Degree: Degree 2 per ANSI/ISA S82.01

Installation Category: Category III per ANSI/ISA S82.01

Product Safety:

The 875 Analyzer has been designed to meet electrical safety descriptions listed in Table 2. For detailed information, or status of testing laboratory approvals/certifications, contact IPS.

Table 2. Product Safety Specifications

Testing Laboratory, Types of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
CSA Ordinary locations.	For panel mounted units, see note (a).	C
CSA for Class I, Division 2, Groups A, B, C, and D; Class II, Division 2, Groups F and G; and Class III, Division 2 hazardous locations	Temperature Class T4. For CSA loop certified non-incendive circuits, see MI 611-206. For panel mounted units, see note (a).	
FM Ordinary locations.	For panel mounted units, see note (a).	F
FM nonincendive for Class I, Division 2, Groups A, B, C, and D; Class II, Division 2, Groups F and G; and Class III, Division 2 hazardous locations	Temperature Class T4. For panel mounted units, see note (a).	
ATEX Ex protection 'n' for Zone 2; II 3 G EEx nC[L] IIC. (b)	Temperature Class T4 at maximum ambient temperature of 60°C (140°F).	N
IECEx protection 'n' for Zone 2; Ex nA nL nC [nL] IIC	Temperature Class T4 at maximum ambient temperature of 60°C (140°F).	D
UL Ordinary locations	- - -	U

(a)Panel-mounted unit must be installed as follows:
For Ordinary and Class I, Division 2 locations: install in a protective enclosure to prevent access to live parts.
For Class II and Class III Division 2 locations: install in a dusttight enclosure.

(b)The L means that the unit contains energy limited circuits to the sensor.

4. Installation

Unpacking

1. Remove the analyzer from the shipping container and check for visible damage.
2. Save the container until you determine that no shipping damage has occurred.
3. If the analyzer has been damaged, notify the carrier immediately and request an inspection report. Obtain a signed copy of the report from the carrier and call the IPS Global Client Support Center at 1-866-746-6477 or contact your local IPS representative.

Identification

A data label, fastened to the top surface of the enclosure on panel-mounted devices and to the right side on surface- or pipe-mounted devices, provides the model number and other information. A second data label, fastened to the right side surface, provides configuration information pertinent to your particular analyzer. In addition, an agency label, showing electrical certification information, is located on the top surface of the enclosure on panel-mounted devices and to the left side on surface- or pipe-mounted devices.

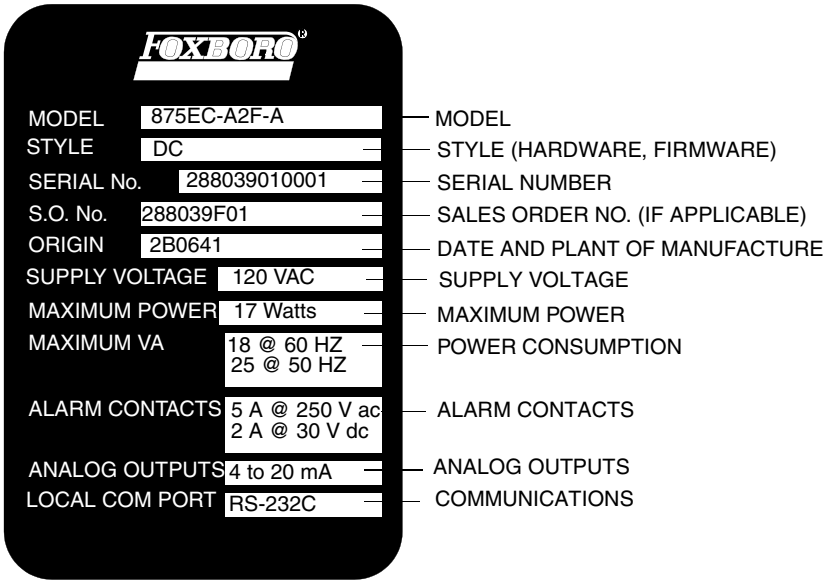


Figure 2. Sample Information Data Label

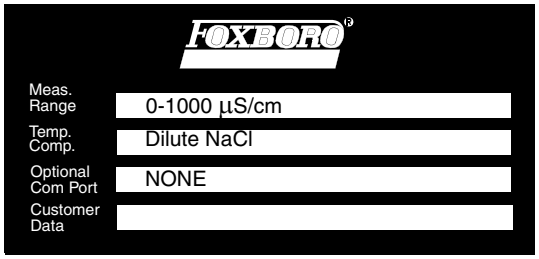


Figure 3. Sample Configuration Data Label

Mounting

Panel Mounting

Panel mounting of the analyzer is shown in Figure 4. For panel cutout size, space requirements, and other dimensional data, see DP 611-164. Place the analyzer into the panel cutout from the front side and fasten it to the panel with appropriate hardware via the four holes in the corners of the analyzer bezel. The basic enclosure of the panel-mounted analyzer meets NEMA 1 requirements for general purpose, indoor applications. However, when mounted in a panel and gasketed in place with the IPS supplied gasket, the front surface provides the environmental and corrosion resistant protection of NEMA Type 4X, CSA encl. 4X, and IEC IP65.

⚠ WARNING

1. All wiring connections are located on the rear of the analyzer enclosure. Therefore, to meet electrical safety specifications, the analyzer must be installed in a protective enclosure to prevent accessibility to live parts. For Class II and Class III, Division 2 locations, the analyzer must be installed in a dusttight protective enclosure.
2. Further, to meet CE requirements, a grounded metal enclosure is required. To assure a good ground, the edges of the panel opening that receives the analyzer must **not** be painted.
3. To meet the requirements of NEMA 4X, CSA encl. 4X, and IEC IP65, the panel cutout dimensions must be held to tolerances shown in DP 611-164 and the analyzer must be mounted as shown in Figure 4.

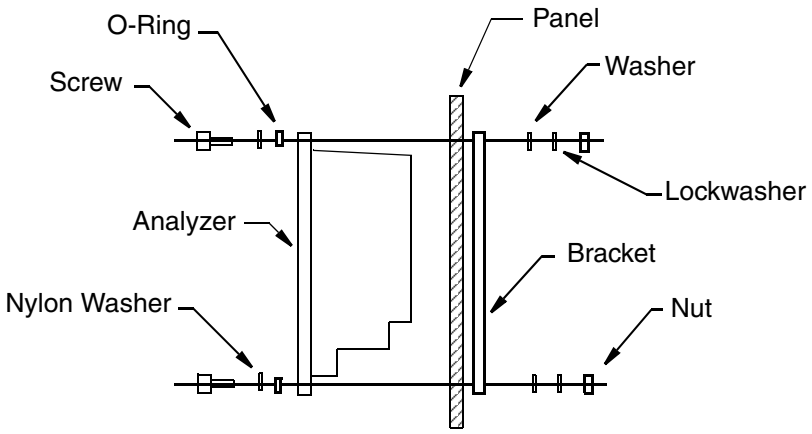


Figure 4. Panel Mounting

Surface Mounting

Surface mounting of the field-mounted analyzer is shown in Figure 5. Fasten the mounting bracket to the analyzer using the screws, washers, and lockwashers provided. Then, fasten the mounting bracket to your surface using appropriate hardware. For space requirements and other dimensional data, see DP 611-164. The field-mounted enclosure provides the environmental and corrosion-resistant protection of NEMA Type 4X, CSA encl. 4X, and IEC IP65.

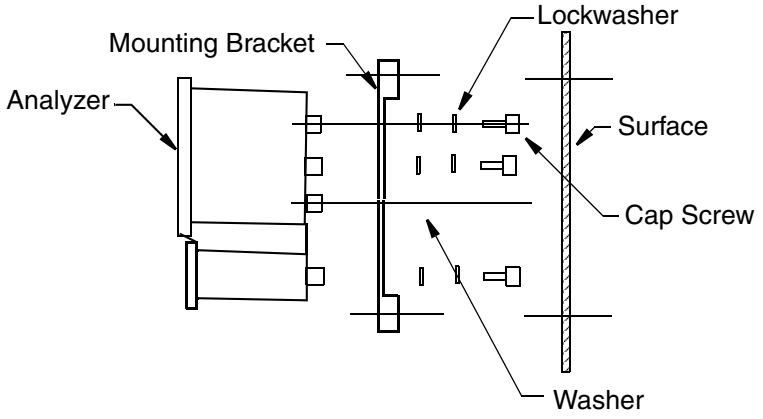


Figure 5. Surface Mounting

Pipe Mounting

Pipe mounting of the field-mounted analyzer is shown in Figure 6. Fasten the mounting bracket to the analyzer using the screws, washers, and lockwashers provided. Then, fasten the mounting bracket to a DN50 or 2-inch pipe using the hardware provided. For space requirements and other dimensional data, see DP 611-164. The field-mounted enclosure provides the environmental and corrosion-resistant protection of NEMA Type 4X, CSA encl. 4X, and IEC IP65.

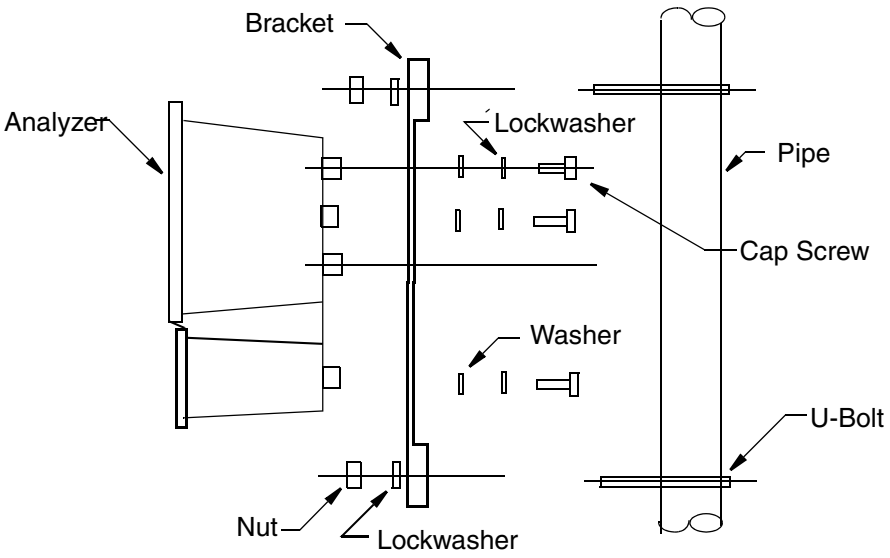


Figure 6. Pipe Mounting (Vertical Pipe Mounting Shown)

Wiring

⚠ WARNING

Wiring must comply with any existing local regulations. To meet CE requirements, this must include a switch or circuit breaker, marked as a disconnecting device, and located in close proximity to the analyzer and within easy reach of the operator.

⚠ CAUTION

1. Your analyzer uses printed wiring assemblies with MOS devices that are highly susceptible to damage from electrostatic discharge. Relatively low static potential can rupture MOS devices resulting in shorted gate or degraded device characteristics. IPS recommends that all assemblies with MOS devices be handled with the user grounded by wearing a conductive wrist strap or by standing on an ESD mat.
2. Your analyzer was made to accept a certain supply voltage. Check the data plate on the transmitter cover for correct supply voltage before wiring.

NOTE

1. To meet CE requirements:
   a. The ac cable must be routed away from all other I/O wiring, especially the sensor cable.
   b. All wiring must be enclosed in grounded metal conduit.
2. Refer to MI 611-206 for FM, CSA, and IEC wiring requirements.
   Refer to MI 611-208 for European (ATEX) safety information

The recommended distance between your analyzer and sensor should be no more than 33 m (100 ft).

Panel-Mounted Analyzer

If you have a panel-mounted analyzer, make your wiring connections directly to the terminals on the rear of the housing. Terminal identification is shown in Figure 7 and described in Table 4.

Pipe- or Surface-Mounted Analyzer

If you have a pipe- or surface-mounted analyzer, the wiring connections are located in the lower compartment of the housing. They are accessible via three openings on the bottom of this compartment. There are also two knockouts for additional field wiring entrance. To remove the knockouts:

1. Perform this procedure with the lower compartment cover in place to give the enclosure extra support.
2. Place a screwdriver blade in the ridge of the knockout.
3. Rap the screwdriver sharply with a hammer until the knockout begins to give way.
4. Repeat Steps 2 and 3 around the circumference of the knockout until the knockout falls out.

To wire your pipe- or surface-mounted analyzer:

1. Remove the lower housing compartment cover by removing the four screws securing it in place.
2. Remove the plastic shipping caps from the three openings on the bottom of the housing and replace with proper fittings.

⚠ CAUTION

1. To maintain a rating of NEMA 4X, CSA encl. 4X, or IEC IP65, open ports must be sealed and instrument covers secured. Also, wiring methods, conduit, and fittings appropriate to the ratings must be used. Table 3 identifies recommended parts.
2. To minimize RFI/EMI effect, use grounded metal conduit on sensor cable and input power leads.

Table 3. Recommended Conduit and Fittings

Material	Conduit	Fitting
Rigid Metal	1/2 inch Electrical Trade Size	T&B* #370
Semi-Rigid Plastic	T&B #LTC 050	T&B #LT 50P or T&B #5362
Semi-Rigid Plastic Metal Core	Anaconda Type HV, 1/2 inch	T&B #LT 50P or T&B #5362
Flexible Plastic	T&B #EFC 050	T&B #LT 50P or T&B #5362

*T&B = Thomas & Betts Corp., 1001 Frontier Road, Bridgewater, NJ 08807

3. Bring the wires from your input (ac) power in the right opening and connect to terminals at the right end of the bottom terminal strip as shown in Figure 7 and described in Table 4.

NOTE

To meet CE requirements, the ac cable must be routed away from all other I/O wiring, especially from the sensor cable.

4. Bring all other wiring (except sensor cable) in the middle opening and connect to appropriate terminals on the bottom terminal strip as shown in Figure 7 and described in Table 4.
5. Bring the sensor cable in the left opening and connect to the appropriate terminals on the top terminal strip as shown in Figure 7 and described in Table 4. If you are using manual temperature compensation and are **not** wiring a temperature measuring device, short terminals 6, 7, and 8 to minimize noise.
6. Connect the remote communications using the RS-232 modular phone plug.

Wiring Connections

NOTE

Connect all cables with user supplied strain relief to prevent excess strain on the terminals.

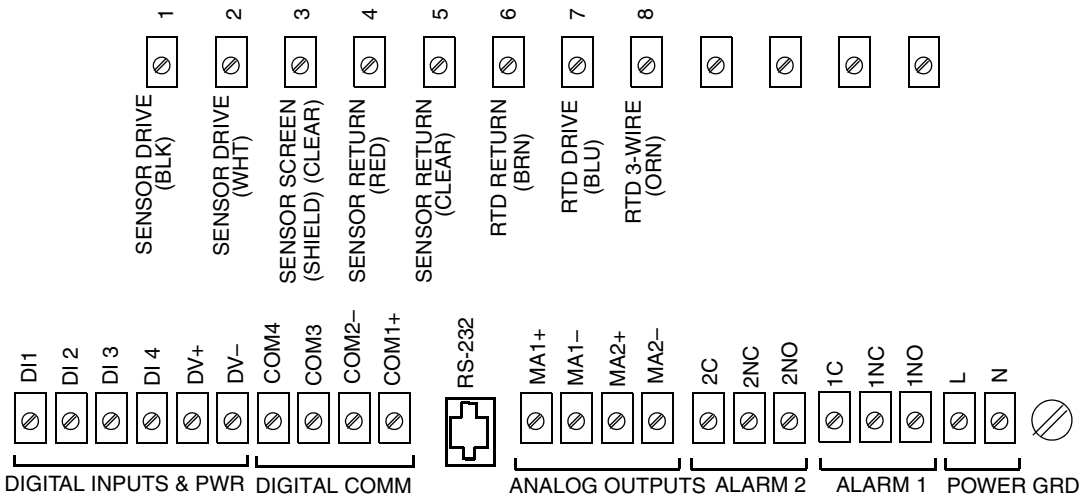


Figure 7. Wiring Connections for 875EC Analyzer

NOTE

The ground connection on panel mounted analyzers is located as shown in Figure 7. The connection on field mounted analyzers is on a case boss just below the power connections.

Table 4. Terminal Identification

Terminal Designation	Description
Sensor Connections	
1	Sensor Drive
2	Sensor Drive
3	Screen (Shield)
4	Sensor Return
5	Sensor Return
6	RTD Return
7	RTD Drive
8	RTD (3-Wire)
Digital, Analog, Alarm, and Power Connections	
DI1, 2, 3, 4	Digital Inputs[a]
DV+, DV-	Digital Power
COM1, 2 COM3, 4	HART I/O Communication Not used
RS-232	Remote Communication (see MI 611-226)
MA1+, MA1– MA2+, MA2–	Analog Output 1 Analog Output 2[b]
1C, 1NC, 1NO 2C, 2NC, 2NO	Alarm 1 Alarm 2
L N G	Power, Line (Black) Power, Neutral (White) Power, Ground (Green)

(a) DI1, DI2, and DI3 are used for switching multiple applications; DI4 is used with Auto Service.

(b) Not used when HART I/O communication is employed.

Digital Input Wiring

The 875EC Analyzer has four digital inputs. Digital input DI1, DI2, and DI3 are used to activate applications 1, 2, and 3 respectively. Digital input DI4 is dedicated to activating the Auto Service function. For configuration information on these functions, see “Run Application” on page 64 and “Auto Service” on page 61.

The voltage to set a digital input high is supplied by the analyzer from terminal DV+. The digital input is activated by closure of a switch that is supplied by the user. If the switch is closed, the digital input voltage is high and if the switch is open, the digital input voltage is low.

⚠ CAUTION

Digital inputs are **only** to be used with the voltage provided by the analyzer.

The following figures show the most likely wiring connections to the 875 digital input interface.

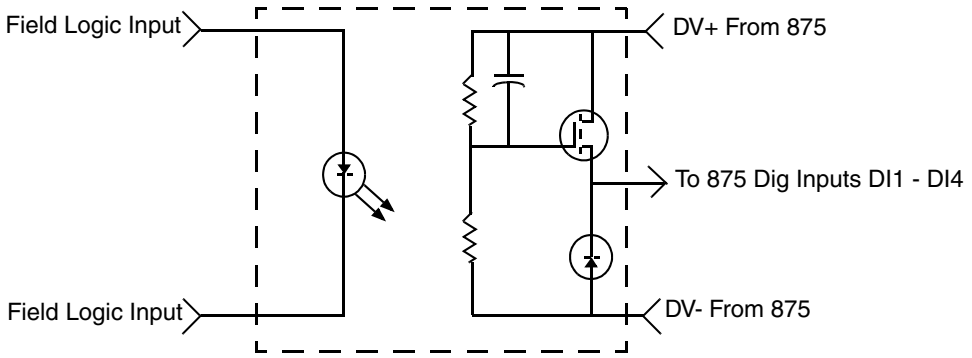


Figure 8. Optically Isolated Interface 24 V dc, FET Output PLC

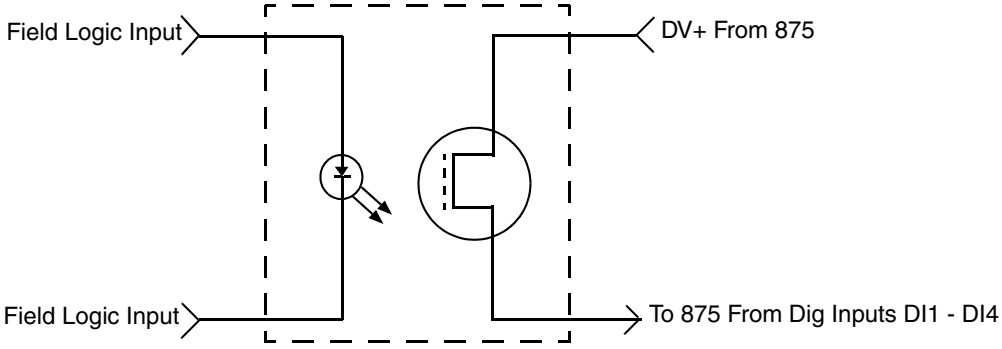


Figure 9. Optical Isolated Analog Switch

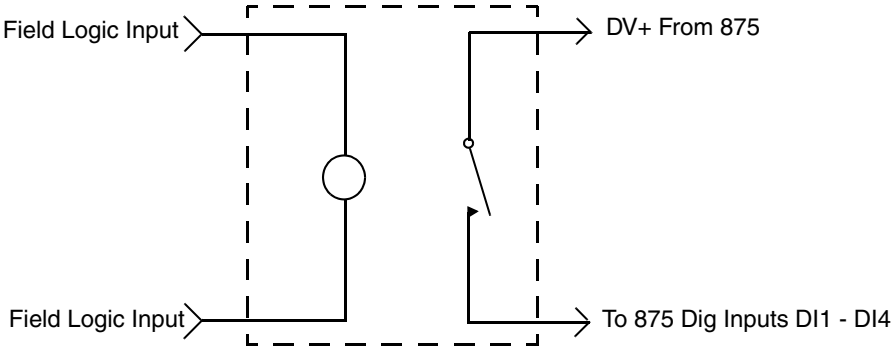


Figure 10. Electromechanical Relay Interface

HART I/O Communication Wiring

If HART Communication (Option -C) is installed, connect your HART loop to the COM1(+) and COM2(-) terminals of the analyzer. See Figure 7. Therefore, if you are configuring the analyzer on the bench (no loop load) with a HART communicator, you must add a 250 Ω resistor.

Analog Output Wiring

There are two analog (4 to 20 mA) outputs in the analyzer. Connect the Analog 1 output at the MA1+ and MA1- terminals of the analyzer. Connect the Analog 2 output at the MA2+ and MA2- terminals of the analyzer. See Figure 7. Analog 2 is **not** used when HART I/O communication is employed.

Alarm Wiring

You can wire an external device (for example a light bulb or horn) to the analyzer. Each alarm relay provides a contact closure which can be used as a switch to turn the external device on or off. The way you wire the external device to the analyzer must be done in conjunction with the way you configure the alarm Trip State (see page 64).

NOTE

Alarm contacts are Form C rated 5 A at 250 V ac, 2 A at 30 V dc, noninductive. The ATEX and IEC limits are 5 A at 160 V ac and 2 A at 30 V dc.

Energized Trip State

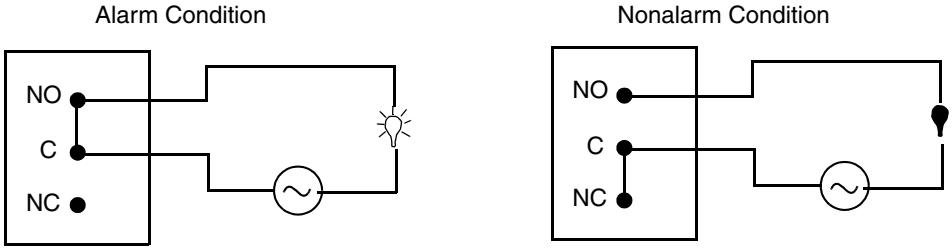


Figure 11. Alarm Wiring in Energized Trip State

De-energized Trip State

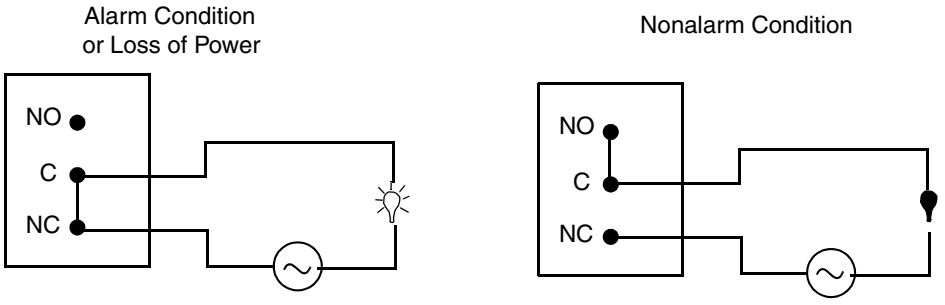


Figure 12. Alarm Wiring in De-energized Trip State

5. Operation Via Local Display

Controls and Indicators

Operator controls and indicators are located on the front panel. Figure 13 shows the panel arrangement. Table 5 identifies the function of each element.

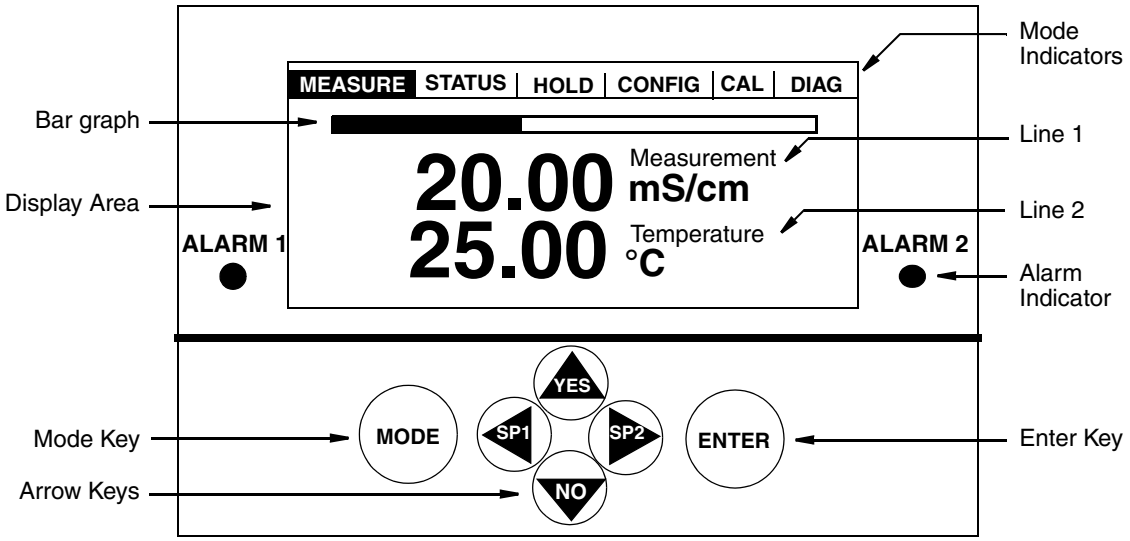


Figure 13. Indicators and Controls

Table 5. Indicators and Controls

Control/Indicator	Function
Mode Indicators	The current operating mode indicator is illuminated. While Hold is active, the Hold indicator blinks.
Display Area	The display is a graphic panel that shows information in combinations of artwork and text.
Bar graph	Displays percent of configured range of the Line 1 value on the display.
Line 1	Displays configured measurements.
Line 2	Displays configured measurements.
Alarm Indicator	Alarm 1 (Alarm 2) indicator is illuminated when Alarm 1 (Alarm 2) is active.
Mode Key	Each press of the **Mode** key selects the next operating mode (Measure, Status, Hold, Configure, Calibrate, and Diagnostic).

Table 5. Indicators and Controls (Continued)

Control/Indicator	Function
Right Arrow Key	Moves you forward through the menu structure. Shifts the cursor to the right in a data entry field. When in Measure mode, enables you to directly access the menu to change the setpoint for Alarm 2 (if configured as a setpoint alarm).
Left Arrow Key	Moves you backward through the menu structure. Shifts the cursor to the left in a data entry field. When in Measure mode, enables you to directly access the menu to change the setpoint for Alarm 1 (if configured as a setpoint alarm).
Up Arrow Key	Increments a numeric value or character when in a data entry field. Shifts the items down when you are in a picklist menu. Answers Yes to a question.
Down Arrow Key	Decrements a numeric value or character when in a data entry field. Shifts the items up when you are in a picklist menu. Answers No to a question.
Enter Key	Enters and saves the changed menu picklist choices or numeric value or character data entry.

Display

The display is a 240 x 128 pixel dot matrix LCD. It is backlighted for viewing under low light conditions.

Dual Measurement Screen

This screen is displayed in Measure mode when the analyzer is configured for dual line measurements.

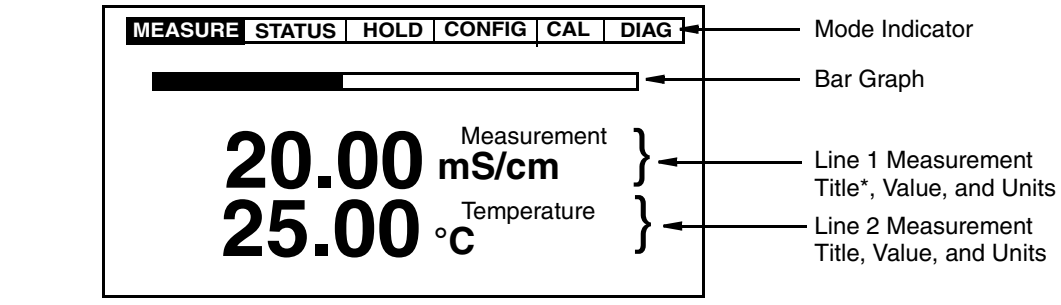
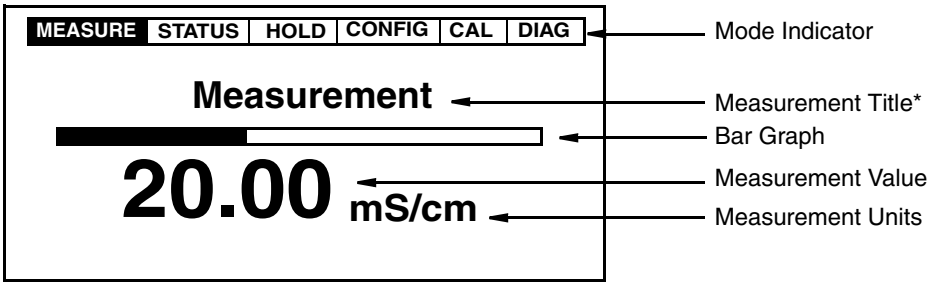


Figure 14. Sample Dual Measurement Screen

Single Measurement Screen

This screen is displayed in Measure mode when the analyzer is configured for single line measurements, scanning measurements, or user selectable measurements.



*Application number instead of Title if Number of Apps >1

Figure 15. Sample Single Measurement Screen

Fault Messages

While you are in Measure mode, the display alternates between the Measurement screen and the Fault screen (approximately every two seconds) when a fault is occurring. In the case of multiple faults, the fault with the highest severity is shown. In general, you can enter the Diagnostic mode to obtain more detail about the fault and receive guidance on how to correct the problem. Fault types are summarized below.

NOTE

Some diagnostic conditions must be configured "enabled" for a fault message to be displayed.

Sensor Fault

Sensor Fault is displayed in Measure mode (if the diagnostic is enabled) when a **Leakage**, **ATC Short**, or **ATC Open** fault is present. The analyzer is still configurable. For **ATC Short** or **ATC Open** faults, measurements are held at the fail-safe value if so configured.

Configuration Fault

Configuration Fault is displayed in Measure mode (if the diagnostic is enabled) when the current loop output (**4-20 Range**), the temperature compensation (**Comp Range**), or the display line measurement (**Meas Range**) exceeds the upper or lower bound for the configured range.

Analyzer Fault

Analyzer Fault, which is displayed in Measure mode, indicates an analyzer fault. Depending on the severity of the problem, the analyzer may still be configurable and analog measurements held at the fail-safe value if so configured.

Digital Fault

Digital Fault is displayed in Measure mode when a digital communication problem occurs.

Slope Error

Slope Error is displayed in Configuration mode when errors made during the entry of custom tables cause an invalid slope.

Table Entry Error

Table Entry Error is displayed in Configuration mode when errors are made during entry of custom tables, such as not having at least one custom point high enough in the range.

Passcode Access

Analyzer security is provided by the use of passcodes through the front panel, remote control, or digital communication interfaces. The passcodes for three levels of security can be established in Configuration mode by users having access to Level 1. Table 6 defines passcode access to the different features of the analyzer.

The legend for the table is V = View and X = View and/or change.

NOTE

1. Passcode Levels 2 and 3, while less complete than Level 1, are simpler to use because there are fewer selections to step through in the menu trees.
2. The factory default pass code for all three levels is **0800**.

Table 6. Passcode Access

Feature	No Passcode	Level 3	Level 2	Level 1
Measurement Mode				
Measurement	V	V	V	V
Status Mode				
Status	V	V	V	V
Hold Mode				
Off		X	X	X
On Present		X	X	X
On Manual		X	X	X
Configuration Mode				
Sensor	V	V	V	X
Number of Apps			V	X
Application	V	V	X	X
Measurement	V	V	X	X
Meas Units - Custom			V	X

Table 6. Passcode Access (Continued)

Feature	No Passcode	Level 3	Level 2	Level 1
Temp Comp	V	V	X	X
Custom			V	X
Display	V	V	X	X
Analog	V	V	X	X
HART	V	V	X	X
Auto Service			V	X
Alarm		V	X	X
Run Application		V	X	X
Remote			V	X
Cal Parameters			V	X
Automatic Hold			V	X
Diagnostics			V	X
Timeouts			V	X
Date and Time			V	X
Analyzer Names			V	X
Passcode				X
LCD Adjust			X	X
Factory Default				X
Calibration				
Sensor		X	X	X
Analog n				X
Diagnostics				
View Faults	V	V	V	V
Resume Faults		X	X	X
View History		V	V	V
Demand Report		X	X	X
Erase History				X

Any time a passcode is required, the display shows **Passcode 0000**. Use the arrow keys to enter your passcode. When the proper digits are shown, press the **Enter** key.

The passcode access expires when you change to another mode.

Viewing and Changing Data

In the Status, Hold, Calibration, Configuration, and Diagnostic modes, you need to move through a structure of parameters (using the arrow keys and **Enter** key) to view (and in some modes, to change) the value or status of a particular parameter. To aid you in configuration, structure diagrams are provided in the following sections and in Appendix A on page 83.

Note that the **Up** and **Down** arrow keys scroll through a picklist menu in either direction. Also, note that the arrow keys can be used to increment one position at a time, or advance continuously through a menu or string of values by holding the key in the depressed position.

The following example shows how to use the keys in moving through the structure, make a picklist selection and a numeric entry. The example used is that of configuring temperature units, temperature mode, and fail signal in Configuration mode. For the example, assume Fahrenheit temperature units and an automatic temperature mode with a fail-safe signal of 77.0°F. In following the procedure, refer to Figure 16.

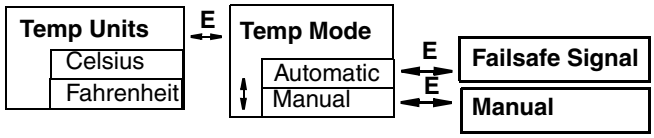


Figure 16. Example of Structure Diagram

1. Use the **Right** arrow key or **Enter** key to move to **Temp Units** on the upper line of the display. The presently configured temperature unit is shown in the data entry box.
2. Use the **Up** or **Down** arrow key to move to the **Fahrenheit** "picklist" selection onto the display. Save your choice by pressing the **Enter** key.

— NOTE

It is important that you save your choice by pressing the **Enter** key. Using the **Left** or **Right** arrow key to view another menu without first pressing the **Enter** key does not save the new choice but retains the previous choice and routes you in the structure from that point.
For example, if **Celsius** was previously selected and you moved to **Fahrenheit**, pressing the **Right** arrow key instead of the **Enter** key routes you to **Temp Mode** but retains a temperature unit of **Celsius**.

3. Next, **Temp Mode** is shown on the upper line of the display and the presently configured temperature mode is shown in the data entry box. Use the **Up** or **Down** arrow key to move to the **Automatic** "picklist" selection onto the display. Save your choice by pressing the **Enter** key.
4. Next, **Failsafe Signal** is shown on the upper line of the display and the current fail signal value (**0.0**) in the data entry box. The value can have five digits plus a leading minus sign (if required) and an embedded decimal point.
5. Because you do not need to change the tenths digit, use the **Left** arrow key to move the cursor under the units digit. Use the **Up** arrow key to change this digit to **7**.
6. Use the **Left** arrow key to move to the tens digit and the Up arrow key to change this digit to 7. You have now achieved your goal of setting a value of 77.0, so press **Enter**. This enters your value of 77.0.

— NOTE

1. If a leading minus sign is present, positioning the cursor under the sign and pressing the **Up** or **Down** arrow key changes the sign.

2. In most situations, repeatedly pressing the **Left** arrow key returns you to previous menus. However, the **Left** arrow key becomes inoperative for this purpose when you are entering numerical values.

Accessing Operating Modes

The operating mode is selected by pressing the Mode key on the front panel. Each press of the key selects the next operating mode in sequence. See Figure 17. When you reach the desired mode, press **Enter**.

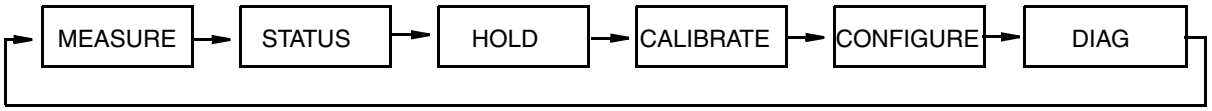


Figure 17. Mode Key Operation

Measure Mode

Measure is the normal operating mode of your analyzer. The analyzer powers up in Measure mode. If another mode is active and you want to go to Measure mode, press the **Mode** key until the **Measure** indicator is illuminated.

Measurements are user configured to display conductivity measurement, absolute conductivity value, temperature measurement, or analog output value.

Measure mode uses one of four display screen presentations: Single, Dual, Scan, or User Selected. The first three are set in Configure mode. User Selected is enabled by the **Up** and **Down** arrow keys. See Figure 18.

- **Single:** The measurement title, value and unit are displayed. The bar graph shows the value's percentage of full scale.
- **Dual:** Two measurement titles, values, and units are displayed. The bar graph shows the first line's percentage of full scale.
- **Scan:** Several measurements can be selected to alternate on the display in a designated scan time. When the analyzer is in Scan mode, the bar graph is inactive.
- **User Selected:** Any measurement can be temporarily scrolled onto the display by using the **Up** and **Down** arrow keys. The display shows the measurement title, value, and unit. The bar graph is inactive. The display returns to the configured values by pressing the **Mode** key or when the Timeout period expires.

The analyzer can be configured for up to three applications. You can configure the **Run Application** parameter to display the desired application. In addition, an automatic mode is provided that switches between the three applications depending on the measurement value. Each application must be configured separately before use. Digital inputs can also be used to switch applications.

Diagnostics are run continuously in Measure mode. If a fault occurs, the display alternates between the Measurement display and the fault display. In the case of multiple faults, the fault with the highest severity is shown. You can then enter the Diagnostic mode to obtain more detail

about the fault and receive guidance on how to correct the problem. The alarm and analog outputs also indicate a fault if so configured. If an alarm is based on a fault, suppressing the fault in Diagnostic mode does not affect the alarm operation.

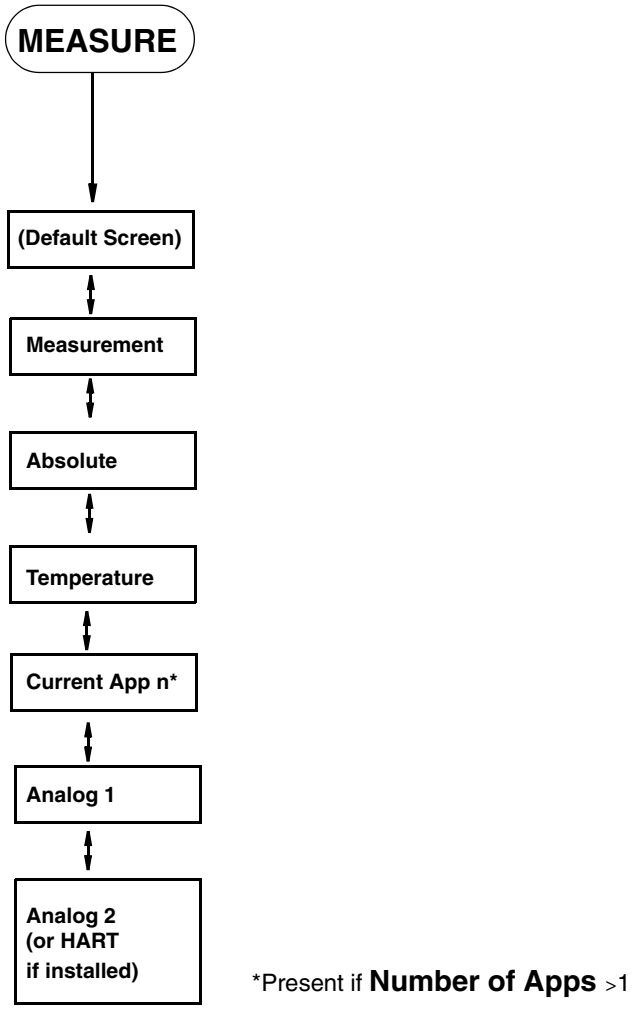


Figure 18. Measure Mode Structure Diagram

You can also view analyzer measurement data on a personal computer by using the Hyperterminal accessory. To do this, connect the RS-232 port on your analyzer to a serial port on your computer. Make sure the port settings on your computer match those on your analyzer. See "Remote" on page 65.

Status Mode

Refer to Figure 20.

The Status mode enables you to view the measurement and system parameters and thus assess the performance of the loop. You can not edit them in this mode. All measurements and outputs continue while you are in the Status mode.

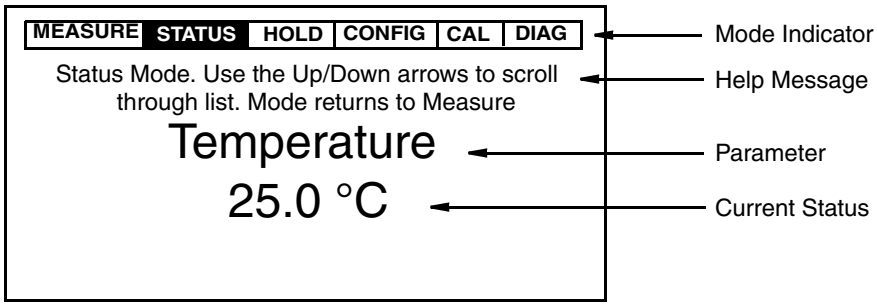


Figure 19. Sample Status Screen

To enter the Status mode, press the **Mode** key until the **Status** indicator is illuminated. Then press the **Enter** key. Move through the menu by using the **Up** and **Down** arrow keys. See Figure 20. The display returns to Measure mode when you press the **Mode** key or when the Timeout period expires. The Status menu contains the following parameters:

Table 7. Status Parameters

Parameter	Description	Units	Notes
Current App n	Application number currently running (if number of applications is greater than 1).	As selected	Num Apps > 1
Temperature	Process temperature	Temp Unit	
Absolute	Uncompensated conductivity signal	Meas Unit	
ATC Resistance	Resistance of temperature compensator (0.0000 to 9999.9)	Ohms, kilohms	
Cal Person/App n	Name of last calibrator	- - -	
Cal Date/App n	Date of last calibration (mm/dd/yyyy)	- - -	
Cal Type/App n	Type of last calibration (solution, factory default, or bench)	- - -	
Cal Temperature/ App n	Temperature calibration type of last calibration (default, custom, solution, failsafe, manual)		
Analog 1	Analog Output 1	mA	
Analog 2	Analog Output 2 (or HART analog output if installed)	mA	
Tag Name	Tag name	- - -	
Location	Location of measurement	- - -	

Table 7. Status Parameters (Continued)

Parameter	Description	Units	Notes
Sales Order Number	Sales order number	- - -	
MS Code	Model code	- - -	
Serial Number	Serial number	- - -	
Software Version	Software version	- - -	
Device Name	Device name	- - -	
Device Type	Device type	- - -	
Comm Type	Type of communication	- - -	
Tag Num	Tag number	- - -	
Line Frequency	ac Line frequency	Hz	
Time	Current time	- - -	
Date	Current date	- - -	
History Log	View up to 10 of the most current history log entries (if present)	- - -	0 to 10 entries shown

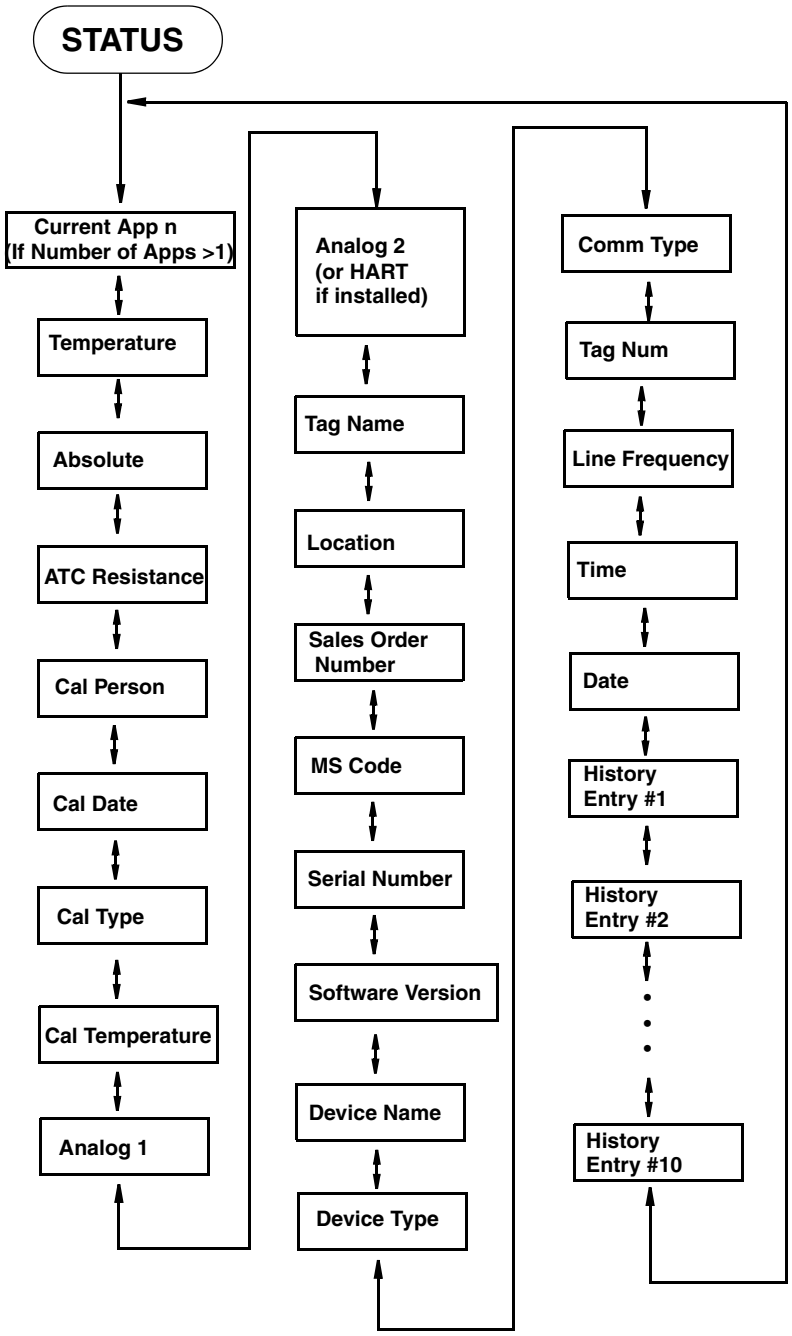


Figure 20. Status Mode Structure Diagram

Hold Mode

Refer to Figure 22.

The Hold mode enables you to manually hold the output at a determined value, thus allowing you to configure or calibrate the analyzer or perform sensor maintenance without disturbing the control loop. Outputs are driven to a preconfigured state or held at their current values. During calibration, the analyzer continues performing live measurements.

To enter the Hold mode, press the **Mode** key until the **Hold** indicator is illuminated. Press **Enter**. At the prompt, **Passcode 0000**, enter the passcode for Level 1, 2, or 3 and then press the **Enter** key. If you enter the incorrect passcode, the display returns to **Passcode 0000**. If you enter the correct passcode, the display briefly reads **Unlocked** and then changes to **Hold Mode/Off**. Refer to Figure 22. In the **Hold Mode** menu, select **On Present** to hold all values and states at their current level or **On Manual** to set all values and states at desired levels.

NOTE

If you entered the passcode for Level 3 and selected **Manual**, you can engage Hold but cannot change the settings under **Manual**.

Additionally, in Configuration mode, you can use the **Automatic Hold** parameter to automatically activate the Hold feature each time you enter Calibration or Configuration mode. In this Configuration mode parameter, you can select **Off**, **Present**, or **Manual**. However, if you select **Manual**, you must go to Hold mode to set the values. Hold mode configuration takes priority over Automatic Hold configuration.

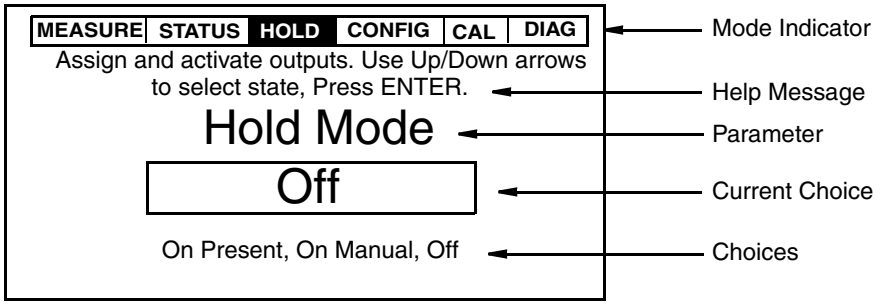


Figure 21. Sample Hold Screen

If you select **On Present** and press the **Enter** key, the display briefly reads **Hold Engaged** and proceeds to Measure mode and the outputs are held.

If you select **On Manual** and press the **Enter** key, the display proceeds to **Alarm 1**, the first of a series of parameters to set values and states to desired levels during hold.

To set the output for **Alarm 1** and **Alarm 2**, select **Maintain** to maintain the alarm in its present condition while in Hold mode, **On** to activate the alarm while in Hold mode, or **Off** to deactivate the alarm while in Hold mode.

To set the output for **Analog 1** and **Analog 2**, select **Live** to not hold the output or **Fixed** to hold the output at a desired value. If you selected **Fixed**, enter a value from 3.8 to 20.5 mA by 0.1 mA increments.

If you have HART or other digital communications installed, you can hold the measurement and temperature values for each digital output at desired values. To do this, enter values for **Digital Measure** and **Digital Temp**. The measurement units are as configured under "Measurement" on page 45. The value must be within the scale configured. The temperature units are as configured under "Temp Unit" on page 44. The value can be from -20 to +200°C (-4 to +392°F) by 0.1° increments.

When you have finished making the manual selections, the display briefly reads **Hold Engaged** and proceeds to Measure mode and the outputs are held.

When Hold is engaged, the **Hold** indicator blinks while you are in other modes to indicate that your output is being held. Measurement hold can be maintained indefinitely.

To release Hold, press the **Mode** key until the **Hold** indicator is illuminated. Press **Enter**. At the prompt, **Passcode 0000**, enter the passcode for Level 1, 2, or 3 and then press the **Enter** key. If you enter the incorrect passcode, the display returns to **Passcode 0000**. If you enter the correct passcode, the display briefly reads **Unlocked** and then changes to **Hold Mode/On Present** or **Hold Mode/On Manual**. Use the **Up** or **Down** arrow key to select **Off** and press **Enter**. The display briefly reads **Hold Released** and proceeds to Measure mode.

NOTE

If using the **Automatic Hold** feature, simply return to Measure mode to release the hold.

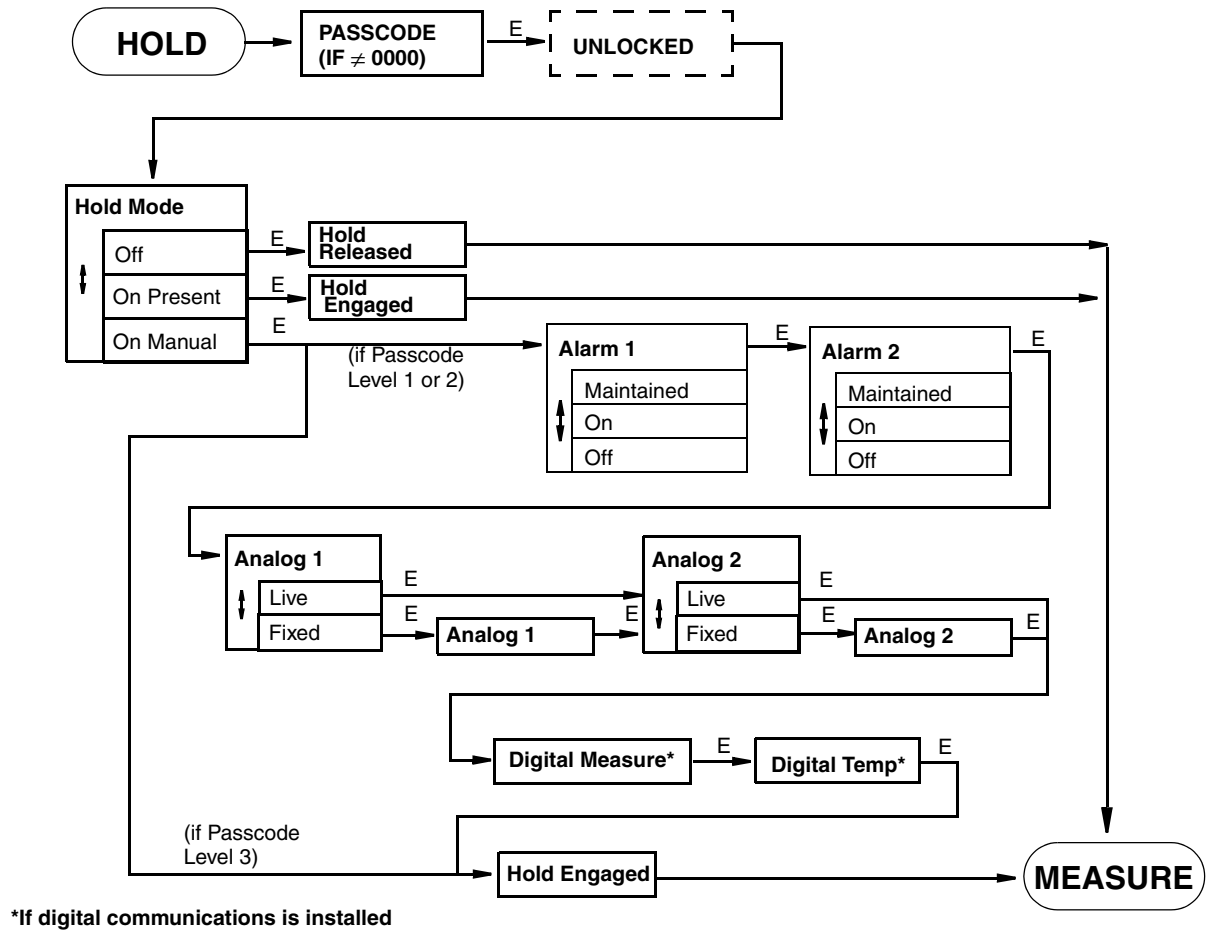


Figure 22. Hold Mode Structure Diagram

Calibration Mode

Calibration routines in your analyzer were designed for simplicity and the elimination of faults. The sensor and the analog outputs are calibrated in this mode. Several calibration routines are available. The **Bench** routine is a sensor/analyzer calibration accomplished by using specific resistance values input via a decade box or discrete resistors. The **Solution** routine calibrates the cell and analyzer together based upon solution conductivity. It enables you to enter or edit the conductivity value(s) of your solution. A single point offset (to bias the measurement by a constant value), single point span (to change the gain or upper value), or 2-point solution calibration can be performed. The **Bench** routine is recommended because it is not subject to impurities in a solution or temperature variations.

The **Analog n** routine allows you to tune the 4 mA and 20 mA values of the analog outputs.

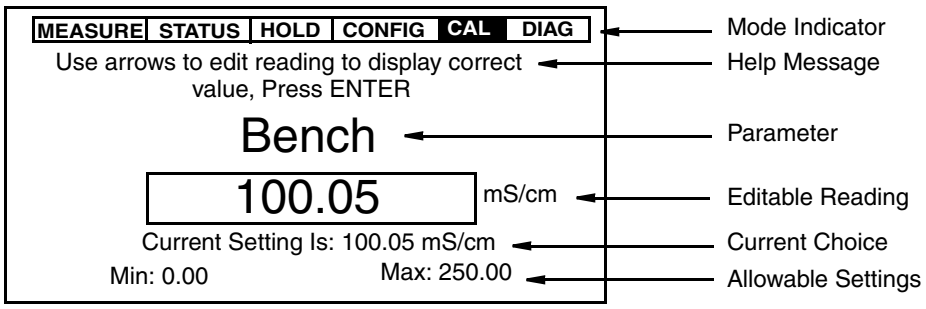


Figure 23. Sample Calibration Screen

To enter the Calibration mode, press the **Mode** key until the **Cal** indicator is illuminated. Then press the **Enter** key. The **Hold** indicator blinks if measurements are held. Also use the **Mode** key to exit Calibration mode and return to Measure mode.

At the prompt, enter the passcode for Levels 1, 2, or 3 and press the **Enter** key. If you enter a correct passcode, the display responds in one of three ways depending on how **Automatic Hold** is configured. If **Automatic Hold** is configured **Off**, the display cautions you that the instrument is not in hold and to press **Enter** to continue or **Mode** to escape. If **Automatic Hold** is configured **Present**, the display cautions that hold is engaged but that outputs are held at the present level. It then unlocks the mode. If **Automatic Hold** is configured **Manual**, the display briefly displays **Hold Engaged** and **Unlocked.**

You are then asked to enter the **Calibrator's Name**. After you do this and press the **Enter** key, the analyzer displays the first category in the top level calibration structure, **Calibrate**. Refer to Figure 24.

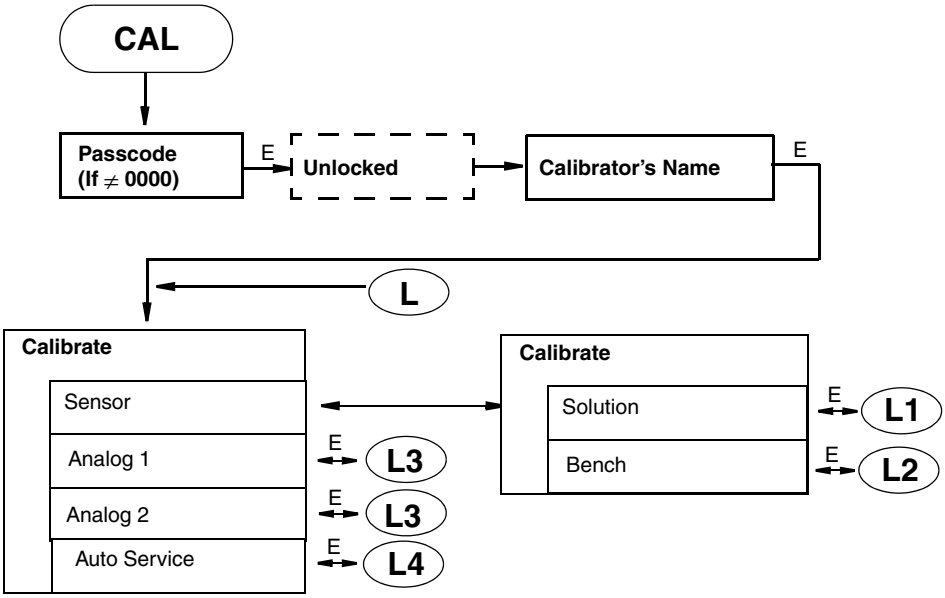


Figure 24. Calibration Category Structure

Solution Calibration

Refer to Figure 25.

If you are using a new (different) sensor, before doing a solution calibration, check that the temperature in Status mode agrees with the actual temperature of your solution. If there is a difference, the actual temperature should be entered before beginning your calibration. To do this, specify **Temp Adj** from the **App n/Sol'n** calibration structure. The correct solution temperature should be entered in **Adjust Temp**. Values of -20 to 200°C or -4 to +392°F in increments of 0.1° can be entered. The units (°C or °F) are determined by your configuration of "Temp Unit" on page 44.

After specifying the temperature, select the **1 Pt Offset**, **1 Pt Span**, or **2 Point** calibration. **1 Pt Offset** is used if you are correcting for a shift in system zero. **1 Pt Span** is used to correct for a shift in system span and should be used at the higher end of the measurement range chosen.

— NOTE

A **2 Point** calibration must be done before using a **1 Pt Offset** or **1 Pt Span** calibration.

Upon the prompt **Immerse In Sol'n**, immerse your sensor into its solution and press **Enter**.

— NOTE

Ensure sensor is centered in appropriately sized container.

When the measurement stabilizes, press **Enter**. If the reading is not correct, edit it to the correct value under **Adjust Offset**, **Adjust Span**, or **Adjust Pt n**. Press **Enter**. Wait for a display of **Calibration Complete** (for **1 Pt Offset** or **1 Pt Span**) or **Immerse In Sol'n 2** (for **2 Point**). If you are doing a 2-point calibration, place the sensor in the second solution and repeat the procedure. If calibration was not successfully completed, the display reads **Calibration Fault** and allows you to select between **Retry** and **Abort**. **Retry** returns you to the beginning of the procedure. **Abort** brings you back to the main calibration menu. If the calibration is successfully completed, the display reads **Calibration Complete**.

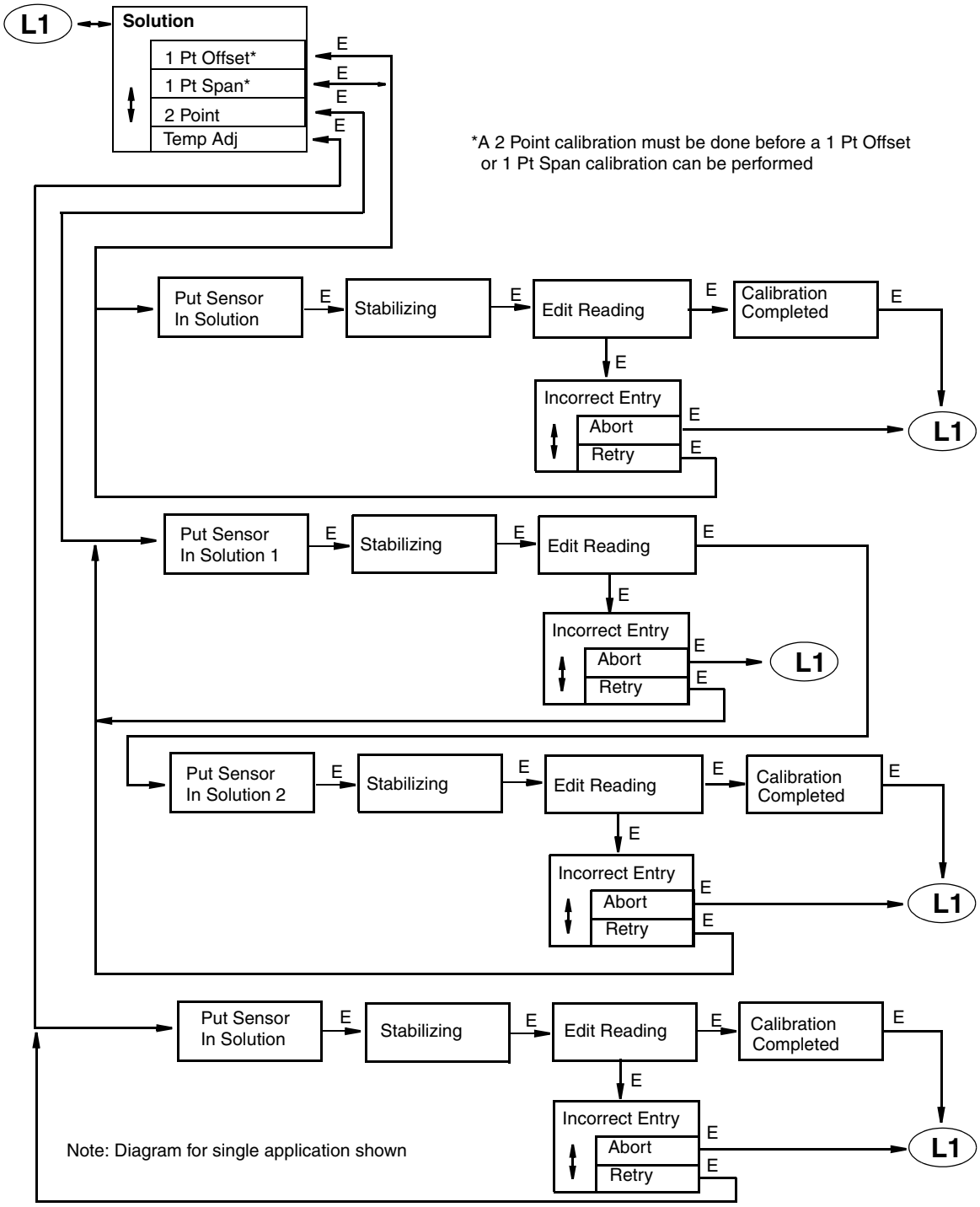


Figure 25. Solution Calibration Structure Diagram

Bench Calibration

Refer to Figure 26.

If you are doing an instrument calibration, specify **Bench** from the top level calibration structure.

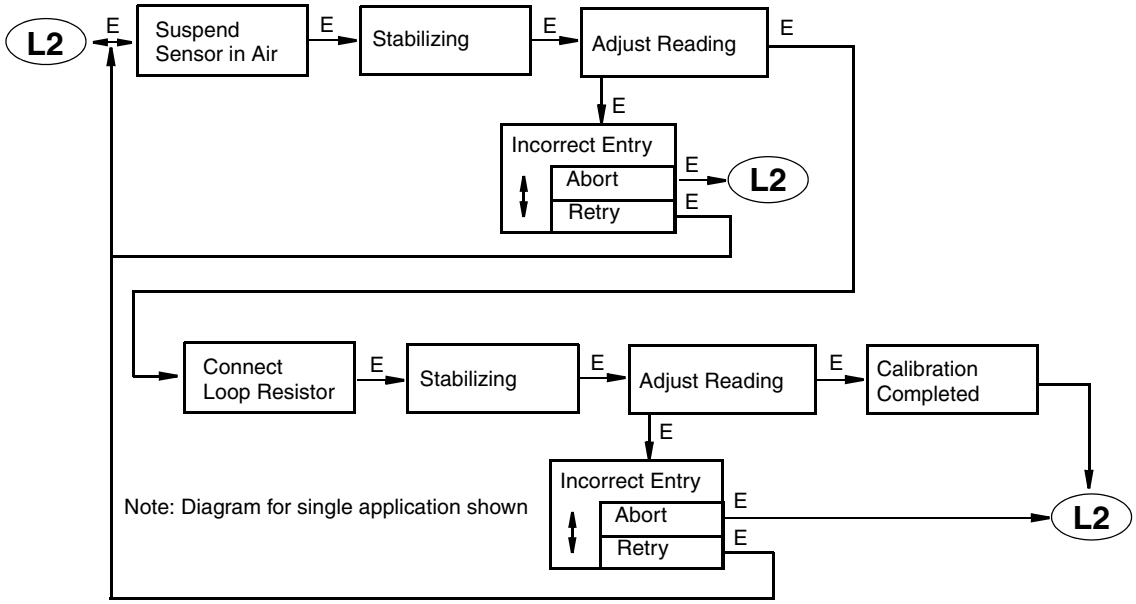


Figure 26. Bench Calibration Structure Diagram

Calculation of Resistances

To perform a bench calibration, you must first calculate the two resistances required. The cell factor is required for these calculations. Cell factors for various sensors are listed in Table 8.

Table 8. Cell Factors

871EC Sensor		871FT English Flow-Thru Sensor		871FT Metric Flow-Thru Sensor		FT10 Sensors		Other Sensors	
Sensor Type	Geometric Cell Factor	Sensor Type	Geometric Cell Factor	Sensor Type	Geometric Cell Factor	Sensor Type	Geometric Cell Factor	Sensor Type	Geometric Cell Factor
-AB	0.588	-1C	11.60	-1C	9.54	FT10-08	38.68	EP307B	2.49
-BW	0.873	-2C	11.60	-2C	9.54	FT10-12	11.71	EP307G	2.49
-EV	0.45	-1D	4.14	-1D	4.61	FT10-16	8.08		
-HP	2.15	-2D	4.14	-2D	4.61				
-LB	0.873	-1E	2.67	-1E	3.05				
-NL	2.35	-2E	2.67	-2E	3.05				
-PN	2.45	-1F	1.11	-1F	1.14				
-PX	2.45	-2F	1.11	-2F	1.14				
-RE	0.873	-1G	0.62	-1G	0.67				
-SP	2.15	-2G	0.62	-2G	0.67				
-TF	2.31	-1H	0.38	-1H	0.27				
-UT	0.873	-2H	0.38	-2H	0.27				
PP	2.185	-1J	0.21	-3E	0.80				
PT	2.185	-2J	0.21	-4E	0.80				
		-3C	3.02	-3F	0.62				
		-4C	3.02	-4F	0.62				
		-3E	1.06	-3G	0.44				
		-4E	1.06	-4G	0.44				
		-3F	0.49	-3H	0.19				
		-4F	0.49	-4H	0.19				
		-3G	0.49	-3J	0.11				
		-4G	0.49	-4J	0.11				
		-3H	0.25						
		-4H	0.25						
		-3J	0.15						
		-4J	0.15						

You also need to choose two conductivity values for your calibration. The higher value should be close to the process control point for best accuracy.

The formula for determining the resistances is:

$$\text{Resistance Input (in ohms)} = \frac{\text{Cell Factor x 1000}}{\text{Value (in mS/cm)}}$$

Example: For a conductivity display of 20.00 mS/cm with an 871EC-SP sensor,

$$\text{Resistance Input} = \frac{(2.15)(1000)}{20.00} = 107.5\Omega$$

— NOTE

The resistance value calculated in the preceding formula and example assume a single loop or turn through the sensor as shown in Figure 27. When extremely small resistances are required, and are not available using equipment at hand, you can loop the decade box wire several times through the sensor and then multiply R_L by the square of the number of loops used, as shown below:

$$R_L = n^2 R_C$$

where:

R_C= Resistance required from calculation
n = Number of loops through sensor donut
R_L = Resistance to use through loop.

Example:

If R_L is calculated as being 0.45 Ω, you may choose to put 10 loops through the sensor and use a 45 Ω resistance.

$$R_L = 10^2 \times 0.45 = 45\ \Omega$$

— NOTE

For optimum performance, use discrete metal film resistors and a single turn of 16 AWG or larger wire.

Calibration Procedure

Upon the prompt, suspend the sensor in air and away from all objects. Press **Enter**. If **Meas Stability** is configured **On**, the display reads **Stabilizing** until stability is achieved. When the message disappears, press **Enter**. If **Meas Stability** is configured **Off**, the display reads **Stability Off**. Watch for the measurement to stabilize before proceeding to press **Enter**. If the reading is not correct, adjust it to the correct value and press **Enter**.

Upon the prompt, connect the loop resistor through the sensor and press **Enter**. If **Meas Stability** is configured **On**, the display reads **Stabilizing** until stability is achieved. When the message disappears, press **Enter**. If **Meas Stability** is configured **Off**, the display reads **Stability Off**. Watch for the measurement to stabilize before proceeding to press **Enter**. If the reading is not correct, adjust it to the correct value and press **Enter**. The Help Message advises **Calibration Completed**. Press **Enter** to return to the **Calibrate** menu or **Mode** to return to Measure mode.

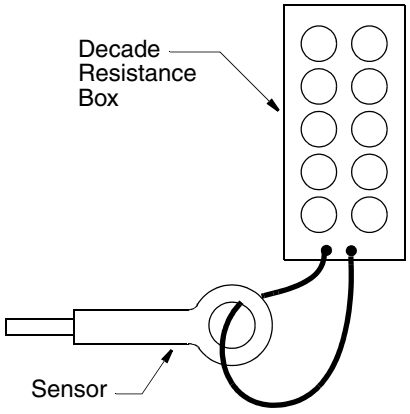


Figure 27. Connection of Loop Resistance

Analog 1 and Analog 2

This subsection allows you to tune the 4 mA and 20 mA values.

The procedure is as follows:

1. Connect a digital current meter between terminals MA1+ and MA1- for Analog 1 and MA2+ and MA2- for Analog 2.
2. With **Analog n** displayed, press **Enter**. The display changes to **Analogn 4 mA**. Press **Enter** again.
3. Calibration is performed by having your current meter read 4 mA. Do this by selecting the degree of change required, **Coarse**, **Medium**, or **Fine,** by using the **Left** and **Right** arrow keys and the direction of the change by using the **Up** and **Down** arrow keys. Repeat Step 3 until your meter reads 4 mA. Then press **Enter**. The display advances to **Analog n 20 mA**.
4. Repeat the procedure shown in Step 3 for 20 mA. The current reading should be 20 mA.

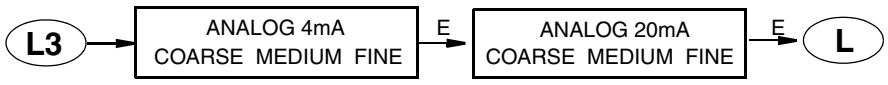


Figure 28. Analog Calibration Structure Diagram

Auto Service

Autoservice automates the process of cleaning and calibrating sensors. When activated, the analyzer sends a signal to a (user-supplied) control instrument which sequences the removal of the sensor from the process, its cleaning, calibration, and reinstallation, all automatically. In order to perform an Auto Service procedure from the analyzer keypad, **Service Initiate/Manual** must be enabled in Configuration mode. Access the procedure by selecting **Auto Service** from the **Calibrate** menu. To begin the Auto Service routine, select **Start** and press **Enter**. To exit from this procedure, select **Exit to Cal** and press **Enter**.

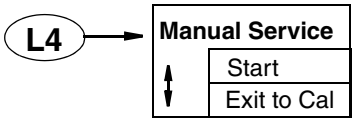


Figure 29. Auto Service Structure Diagram

Configuration Mode

Refer to Structure Diagrams in Appendix A on page 83.

Configuration is the process of establishing functional capability in the analyzer firmware for your application. This section helps you to systematically determine and configure the value or status of each parameter required for your application. IPS recommends that you make configuration changes from the beginning of the menu structure forward. This is because menus are forward referencing meaning that if you start at the beginning and work to the end, you achieve a valid

configuration. Also, the analyzer validates the configuration when attempting to exit configuration and directs you to any invalid menus.

To enter the Configuration mode, press the **Mode** key until the **Config** indicator is illuminated. Press **Enter**. At the prompt, enter the passcode for Levels 1 or 2 and press the **Enter** key. If you enter an incorrect passcode, the display returns to **Passcode 0000**. If you enter the correct passcode, the display presents a picklist to choose **View** or **Change**. If you entered the Level 3 passcode, you can only view the basic configuration parameters. If you entered the Level 2 passcode, you are allowed to view or change the basic configuration parameters. If you entered the Level 1 passcode, you can view or change any configuration parameter. See Table 6 on page 24 for a listing of passcode access to various configuration parameters.

If you selected **Change**, the display responds in one of three ways depending on how **Automatic Hold** is configured. If **Automatic Hold** is configured **Off**, the display cautions you that the instrument is not in hold and to press **Enter** to continue or **Mode** to escape. If **Automatic Hold** is configured **Present**, the display cautions that hold is engaged but that outputs are held at the present level. It then unlocks the mode. If **Automatic Hold** is configured **Manual**, the display briefly displays **Hold Engaged** and **Unlocked**.

After selecting **View** or **Change**, the first category in the top level configuration structure, **Sensor**, is displayed. To view or change another configuration category, press the **Up** or **Down** arrow key. When you have located the desired category, press the **Enter** key. Each category of parameters is shown in subsequent structure diagrams.

⚠ CAUTION

If there are no key presses within the configured Timeout period, the analyzer reverts to Measure mode and all changes are lost.

Making a change to one configuration parameter can cause an invalid selection or out-of-range value in one or more other parameters. To assist you in properly configuring the analyzer, prompts are provided guiding you to these out-of-range parameters.

You can exit the Configuration mode and proceed to another mode at any time by pressing the **Mode** key. If you were in **View**, the analyzer goes directly to Measure mode. If you were in **Change**, the analyzer validates the configuration. If your new configuration **does not** contain invalid entries, the display reads **Configuration OK - Save Changes?** Press the **Yes** key to save the changes or the **No** key to abort the changes. The analyzer then goes to Measure mode. If your new configuration **does** contain invalid entries, the display reads **Configuration Fault - Fix It?** Press the **Yes** key to fix the problem or the **No** key to abort the changes. If **Yes**, the analyzer takes you to the first menu in error. Once the error is fixed, the analyzer validates the configuration. If **No**, the analyzer goes to Measure mode. Figure 30 shows the logic involved.

NOTE

Changes are not implemented until they are saved and measure mode is restored.

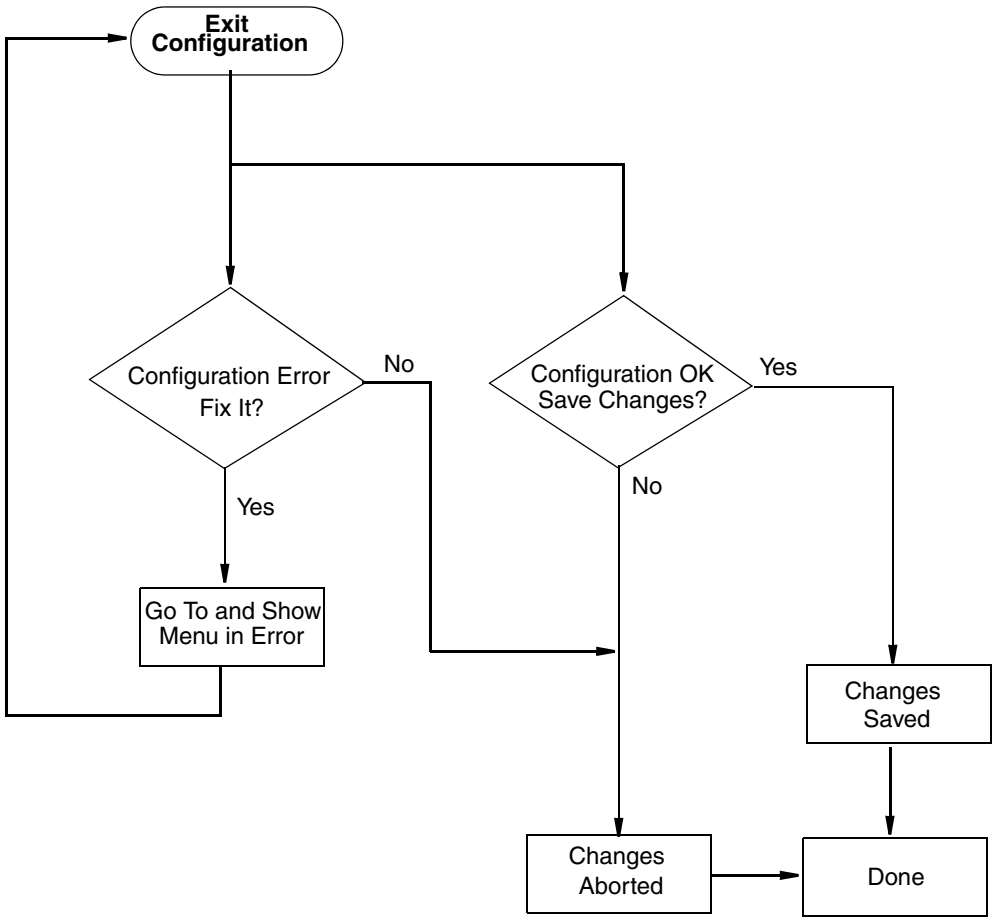


Figure 30. Configuration Mode Exit Flow

Configuration Display

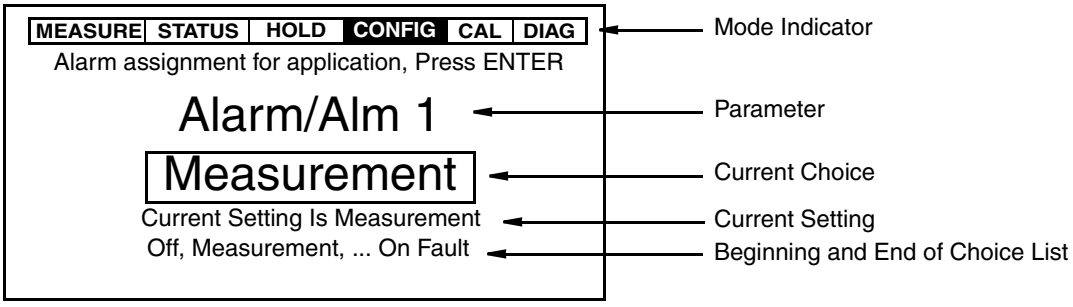


Figure 31. Sample Configuration Screen

Sensor

Refer to Figure A-2 on page 84.

This section of the structure asks you to specify the sensor type and the temperature features that are used for all three applications.

Sensor Type

Specify **Sensor Type** as **871EC**, **871FT English**, **871FT Metric**, **FT10**, or **Other**.

If you choose **Other**, specify the **Cell Factor**. The firmware allows a cell factor entry between 0.0001 and 99.999. Contact IPS regarding the use of other cells with this analyzer.

Temp Type

First, specify the **Temp Type** as **RTD** or **100K Thermistor** (100 kΩ thermistor).

If you specify the **Temp Type** as **RTD**, specify 2-wire or 3-wire RTD and its resistance value as **2 Wire 100Ω**, **2 Wire 1000Ω**, **3 Wire 100Ω**, **3 Wire 1000Ω**, or **3 Wire 100Ω MIL**.

Temp Unit

Specify **Temp Unit** as **Celsius** or **Fahrenheit**. All references to temperature appear in the specified units within the analyzer software.

Temp Mode

Specify the **Temp Mode** as **Automatic** or **Manual**.

In **Automatic** mode, the temperature follows the temperature input RTD or thermistor "ATC" and you can set a temperature **Failsafe Signal** value (in case the RTD or thermistor fails) at the temperature at which you expect the process to be operating.

In **Manual** mode, the temperature can be set at a fixed temperature value and resistance inputs on the temperature terminal are ignored.

Number of Apps

Refer to Figure A-3 on page 85.

This section of the structure asks you to specify the number of applications you wish to preconfigure. It can be **1**, **2**, or **3**. For more information on this subject, see the following section.

Application, Application n

The 875EC Analyzer can be preconfigured for up to three distinct applications. Each application can have its own (standard or custom) display, temperature compensation curve, chemical concentration curve (if applicable), and output configuration. Each application is assigned an identification number (such as 1, 2, or 3).

- App applies if Num Apps = 1
- App1 applies if Num Apps > 1
- App2 applies if Num Apps > 1
- App3 applies if Num Apps > 2.

Measurement

Refer to Figure A-4 on page 85.

This section of the structure asks you to specify the measurement unit, scale, and damping time. If you specify **%**, you must specify the scale for a particular chemical. If you specify a custom unit, you must specify the chemical compensation, the relationship between conductivity units in µS/cm, mS/cm, mS/m, or S/m and Custom units in %, g/l, ppm, oz/gal, ppt, none, or a user defined custom unit.

You can specify **Meas Units** as µ**S/cm**, **mS/cm**, **mS/m**, **S/m**, **%**, or **CUSTOM**.

Measure Unit = µS/cm, mS/cm, mS/m, or S/m

If you selected µ**S/cm,** m**S/cm, mS/m**, or **S/m** as the **Meas Unit**, you must specify the **Scale** as indicated in Table 9.

Table 9. Allowable Scales for 871EC Sensors

Sensor	Units	Scale	Sensor	Units	Scale
AB	µS/cm	200 through 5000	PN	µS/cm	1000 through 5000
	mS/cm	0.2 through 1000		mS/cm	1 through 5000
	mS/m	20 through 5000		mS/m	100 through 5000
	S/m	0.1 through 100		S/m	0.1 through 500
BW	µS/cm	200 through 5000	PX	µS/cm	1000 through 5000
	mS/cm	0.2 through 1000		mS/cm	1 through 5000
	mS/m	20 through 5000		mS/m	100 through 5000
	S/m	0.1 through 100		S/m	0.1 through 500
EV	µS/cm	200 through 5000	RE	µS/cm	200 through 5000
	mS/cm	0.2 through 1000		mS/cm	0.2 through 1000
	mS/m	20 through 5000		mS/m	20 through 5000
	S/m	0.1 through 100		S/m	0.1 through 100
HP and PP	µS/cm	1000 through 5000	SP and PT	µS/cm	1000 through 5000
	mS/cm	1 through 2000		mS/cm	1 through 2000
	mS/m	100 through 5000		mS/m	100 through 5000
	S/m	0.1 through 200		S/m	0.1 through 200
LB	µS/cm	50 through 5000	TF	µS/cm	1000 through 5000
	mS/cm	0.1 through 200		mS/cm	1 through 5000
	mS/m	5 through 5000		mS/m	100 through 5000
	S/m	0.1 through 20		S/m	0.1 through 500
NL	µS/cm	1000 through 5000	UT	µS/cm	50 through 5000
	mS/cm	1 through 5000		mS/cm	0.1 through 200
	mS/m	100 through 5000		mS/m	5 through 5000
	S/m	0.1 through 500		S/m	0.1 through 20

Table 10. Allowable Scales for 871FT English Flow-Through Sensors

Sensor	Units	Scale	Sensor	Units	Scale
1C	µS/cm	2000 through 5000	2J	µS/cm	50 through 5000
	mS/cm	2 through 5000		mS/cm	0.1 through 50
	mS/m	200 through 5000		mS/m	1 through 5000
	S/m	0.2 through 1000		S/m	0.1 through 5
2C	µS/cm	1000 through 5000	3C	µS/cm	1000 through 5000
	mS/cm	1 through 5000		mS/cm	1 through 5000
	mS/m	100 through 5000		mS/m	100 through 5000
	S/m	0.1 through 500		S/m	0.1 through 500
1D	µS/cm	1000 through 5000	3E	µS/cm	500 through 5000
	mS/cm	1 through 2000		mS/cm	0.5 through 2000
	mS/m	100 through 5000		mS/m	50 through 5000
	S/m	0.1 through 200		S/m	0.1 through 200
2D	µS/cm	500 through 5000	4C	µS/cm	200 through 5000
	mS/cm	0.5 through 1000		mS/cm	0.2 through 1000
	mS/m	50 through 5000		mS/m	20 through 5000
	S/m	0.1 through 100		S/m	0.1 through 100
1E	µS/cm	500 through 5000	4E	µS/cm	100 through 5000
	mS/cm	0.5 through 2000		mS/cm	0.1 through 200
	mS/m	50 through 5000		mS/m	10 through 5000
	S/m	0.1 through 200		S/m	0.1 through 20
2E	µS/cm	200 through 5000	3F	µS/cm	200 through 5000
	mS/cm	0.2 through 1000		mS/cm	0.2 through 1000
	mS/m	20 through 5000		mS/m	20 through 5000
	S/m	0.1 through 100		S/m	0.1 through 100
1F	µS/cm	200 through 5000	4F	µS/cm	50 through 5000
	mS/cm	0.2 through 1000		mS/cm	0.1 through 200
	mS/m	20 through 5000		mS/m	5 through 5000
	S/m	0.1 through 100		S/m	0.1 through 20
2F	µS/cm	100 through 5000	3G	µS/cm	200 through 5000
	mS/cm	0.1 through 500		mS/cm	0.2 through 1000
	mS/m	10 through 5000		mS/m	20 through 5000
	S/m	0.1 through 50		S/m	0.1 through 100
1G	µS/cm	100 through 5000	4G	µS/cm	50 through 5000
	mS/cm	0.1 through 500		mS/cm	0.1 through 200
	mS/m	10 through 5000		mS/m	5 through 5000
	S/m	0.1 through 50		S/m	0.1 through 20

Table 10. Allowable Scales for 871FT English Flow-Through Sensors (Continued)

Sensor	Units	Scale	Sensor	Units	Scale
2G	µS/cm	50 through 5000	3H	µS/cm	100 through 5000
	mS/cm	0.1 through 200		mS/cm	0.1 through 500
	mS/m	5 through 5000		mS/m	10 through 5000
	S/m	0.1 through 20		S/m	0.1 through 50
1H	µS/cm	50 through 5000	4H	µS/cm	20 through 5000
	mS/cm	0.1 through 200		mS/cm	0.1 through 100
	mS/m	5 through 5000		mS/m	2 through 5000
	S/m	0.1 through 20		S/m	0.1 through 10
2H	µS/cm	20 through 5000	3J	µS/cm	50 through 5000
	mS/cm	0.1 through 100		mS/cm	0.1 through 200
	mS/m	2 through 5000		mS/m	5 through 5000
	S/m	0.1 through 10		S/m	0.1 through 20
1J	µS/cm	50 through 5000	4J	µS/cm	10 through 5000
	mS/cm	0.1 through 200		mS/cm	0.1 through 50
	mS/m	5 through 5000		mS/m	1 through 5000
	S/m	0.1 through 20		S/m	0.1 through 5

Table 11. Allowable Scales for 871FT Metric Flow-Through Sensors

Sensor	Units	Scale	Sensor	Units	Scale
1C	µS/cm	2000 through 5000	2H	µS/cm	20 through 5000
	mS/cm	2 through 5000		mS/cm	0.1 through 100
	mS/m	200 through 5000		mS/m	2 through 5000
	S/m	0.2 through 1000		S/m	0.1 through 10
2C	µS/cm	500 through 5000	3E	µS/cm	100 through 5000
	mS/cm	0.5 through 2000		mS/cm	0.1 through 500
	mS/m	50 through 5000		mS/m	10 through 5000
	S/m	0.1 through 200		S/m	0.1 through 50
1D	µS/cm	1000 through 5000	4E	µS/cm	50 through 5000
	mS/cm	1 through 5000		mS/cm	0.1 through 200
	mS/m	100 through 5000		mS/m	5 through 5000
	S/m	0.1 through 500		S/m	0.1 through 20
2D	µS/cm	500 through 5000	3F	µS/cm	100 through 5000
	mS/cm	0.5 through 2000		mS/cm	0.1 through 500
	mS/m	50 through 5000		mS/m	10 through 5000
	S/m	0.1 through 200		S/m	0.1 through 50

Table 11. Allowable Scales for 871FT Metric Flow-Through Sensors (Continued)

Sensor	Units	Scale	Sensor	Units	Scale
1E	µS/cm	500 through 5000	4F	µS/cm	100 through 5000
	mS/cm	0.5 through 2000		mS/cm	0.1 through 200
	mS/m	50 through 5000		mS/m	10 through 5000
	S/m	0.1 through 200		S/m	0.1 through 20
2E	µS/cm	200 through 5000	3G	µS/cm	100 through 5000
	mS/cm	0.2 through 1000		mS/cm	0.1 through 500
	mS/m	20 through 5000		mS/m	10 through 5000
	S/m	0.1 through 100		S/m	0.1 through 50
1F	µS/cm	200 through 5000	4G	µS/cm	50 through 5000
	mS/cm	0.2 through 1000		mS/cm	0.1 through 200
	mS/m	20 through 5000		mS/m	5 through 5000
	S/m	0.1 through 100		S/m	0.1 through 20
2F	µS/cm	100 through 5000	3H	µS/cm	50 through 5000
	mS/cm	0.1 through 500		mS/cm	0.1 through 200
	mS/m	10 through 5000		mS/m	5 through 5000
	S/m	0.1 through 50		S/m	0.1 through 20
1G	µS/cm	100 through 5000	4H	µS/cm	10 through 5000
	mS/cm	0.1 through 500		mS/cm	0.1 through 50
	mS/m	10 through 5000		mS/m	1 through 5000
	S/m	0.1 through 50		S/m	0.1 through 5
2G	µS/cm	50 through 5000	3J	µS/cm	20 through 5000
	mS/cm	0.1 through 200		mS/cm	0.1 through 100
	mS/m	5 through 5000		mS/m	2 through 5000
	S/m	0.1 through 20		S/m	0.1 through 10
1H	µS/cm	50 through 5000	4J	µS/cm	10 through 5000
	mS/cm	0.1 through 200		mS/cm	0.1 through 20
	mS/m	5 through 5000		mS/m	1 through 2000
	S/m	0.1 through 20		S/m	0.1 through 2

Table 12. Allowable Scales for FT10 Sensors

Sensor	Units	Scale
FT10-08	µS/cm	50 through 5000
	mS/cm	0.1 through 1000
	mS/m	5 through 5000
	S/m	0.1 through 100
FT10-12	µS/cm	200 through 5000
	mS/cm	0.2 through 2000
	mS/m	20 through 5000
	S/m	0.1 through 200
FT10-16	µS/cm	200 through 5000
	mS/cm	0.2 through 2000
	mS/m	20 through 5000
	S/m	0.1 through 200

Measure Unit = %

If you selected **%** as the **Measure Unit**, you need only specify the chemical being measured. The scale and mS/cm equivalent value are shown in Table 13. Select the **Chemical** as **NaCl**, **H3PO4**, **HCl**, **H2SO4**, **Oleum**, **HNO3**, **NaOH**, **KOH**, **KCl**, **CH3COOH**, or **HF**.

Table 13. Scale in Percent and mS/cm Equivalent Values

Chemical	Scale	mS/cm Equivalent*
Sodium Chloride (NaCl)	0 - 25%	0 to 246.5
Phosphoric Acid (H_3PO_4)	0 - 35%	0 to 208
Hydrochloric Acid (HCl)	0 - 15%	0 to 819
Sulfuric Acid (H_2SO_4) 50°C Ref 30°C Ref 25°C Ref	 99.5 - 93% 99.5 - 93% 0 - 25%	 65.3 to 232.3 43.1to 149 0 to 790
Oleum 65°C Ref 65°C Ref	 42 - 18% 0 - 10%	 15.0 to 78.6 27.0 to 79.0
Nitric Acid (HNO_3)	0 - 10%	0 to 498.9
Sodium Hydroxide (NaOH) 25°C Ref 50°C Ref 100°C Ref	 0 - 15% 0 - 15% 0 - 20%	 0 to 411 0 to 650 0 to 1300
Potassium Hydroxide (KOH)	0 - 6%	0 to 206
Potassium Chloride (KCl)	0 - 16%	8.2 to 220

Table 13. Scale in Percent and mS/cm Equivalent Values (Continued)

Chemical	Scale	mS/cm Equivalent*
Acetic Acid (CH_3OOH)	0 - 8%	0 to 1.556
Hydrofluoric Acid (HF) 0°C Ref 25°C Ref	 99 - 90% 0 - 30%	 68 to 485 0 to 380

*Approximate at reference temperature

Measure Unit = Custom

Before selecting **Custom**, you must determine if measurement in the range desired is feasible. This is best done by reviewing a conductivity curve of the binary process solution in question at varying temperatures. See Figure 32.

NOTE

1. Binary process solutions are those of water and one other primary conductivity contributor, for example water and NaOH.
2. Conductivity typically increases with temperature.

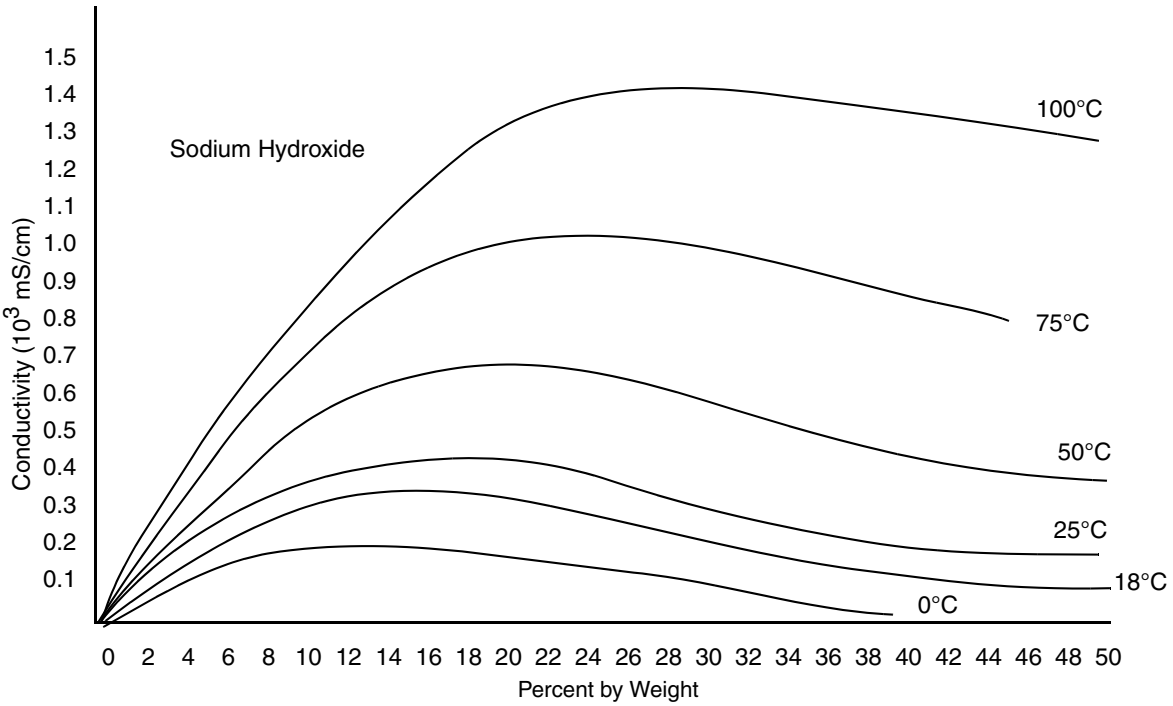


Figure 32. Sample Concentration Curves

Conductivity curves for most solutions encountered are most often a variation of the typical bell curve, that is, the curve has a front slope (increasing conductivity), a top or flat portion, and a back slope (decreasing conductivity). It is not practical to make a percent concentration measurement on both slopes of a conductivity curve. This is because it is possible (and likely) that

a concentration on the front slope and one on the back slope could produce the same conductivity. See Figure 33. Therefore, both standard and custom curves are limited to either the front or back slope of the curve.

— NOTE

An alternative approach to measurements spanning both slopes of a curve is the unique IPS curve switching feature. Contact IPS for recommendations regarding its feasibility for your application.

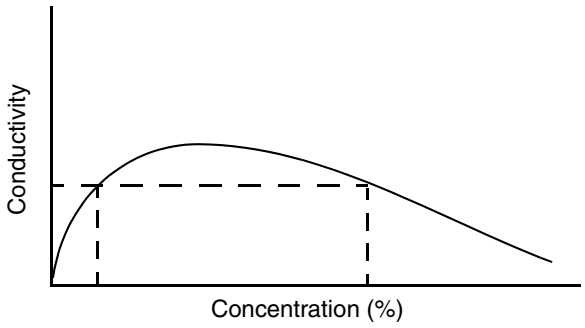


Figure 33. Conductivity Curve

A standard curve of 0 to 15% NaOH (at a reference temperature of 25°C or 50°C) that IPS provides is on the front slope and linear portions of the curve. However, quite often, NaOH is purchased at a concentration of 50% and diluted to the desired concentration. This higher concentration is on the back slope of the curve and thus requires a custom curve set.

Based on literature data, in-line measurements, or lab determination, you might decide to use a custom curve for 50 to 23% NaOH (at or near a reference temperature that reflects the process). The goal is to provide a slope that provides differentiation between percent concentration points. In this example, 50% NaOH would have one measurable and repeatable conductivity and 48% NaOH would have a higher one, as would 46%, 44%, and so forth.

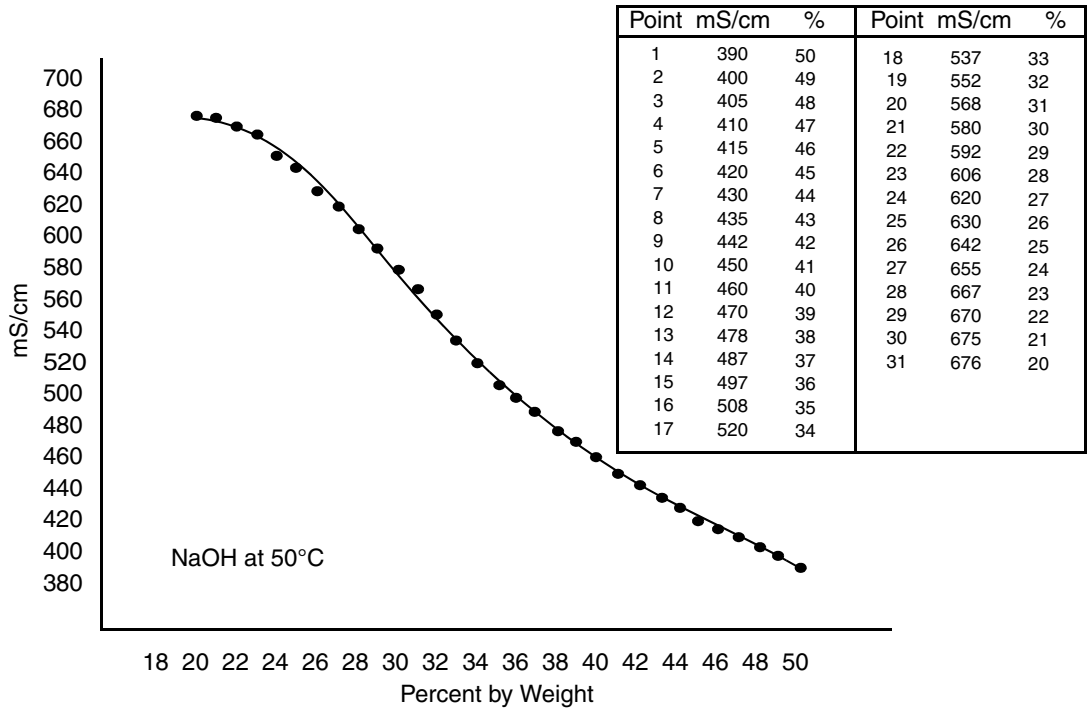
— NOTE

Custom curves most always require custom temperature compensation. See **Custom** temperature compensation on page 56.

After you determine that you need a custom curve, you should specify the **Measure Unit** as **Custom** and then the **Custom Units** as **%** (percent), **g/l** (grams/liter), **ppm** (parts per million), **oz/gal** (ounces per gallon), **ppt** (parts per thousand), **None**, or **User Defined**.

Further, you must specify the chemical compensation, the relationship between the conductivity units (**Base Units**) and the **Custom Units** of your choice.

The process specific compensation data must be generated or extracted in advance of entering it into the analyzer. IPS suggests that the data be plotted graphically as well as tabularly to prepare it for entry into your analyzer. See Figure 34.



Point	mS/cm	%	Point	mS/cm	%
1	390	50	18	537	33
2	400	49	19	552	32
3	405	48	20	568	31
4	410	47	21	580	30
5	415	46	22	592	29
6	420	45	23	606	28
7	430	44	24	620	27
8	435	43	25	630	26
9	442	42	26	642	25
10	450	41	27	655	24
11	460	40	28	667	23
12	470	39	29	670	22
13	478	38	30	675	21
14	487	37	31	676	20
15	497	36			
16	508	35			
17	520	34			

Figure 34. Reference Conductivity vs. Concentration Data

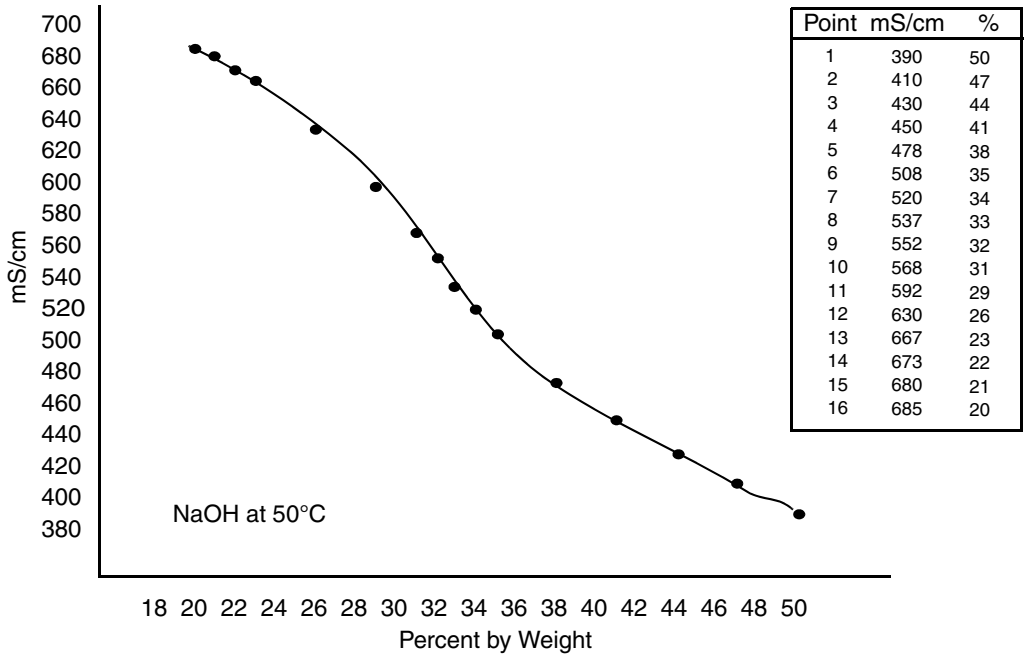
After specifying the **Custom Units**, specify the **Base Units** as μ**S/cm**, **mS/cm**, **mS/m**, or **S/m** and the **Base Scale** and **Custom Scale** as **0.9999**, **9.999**, **99.99**, **999.9**, or **9999**. Then specify a number of points (**Num of Pts**) to plot the compensation curve. The number of points can be specified from 2 to 21. Lastly, for each of the number of points specified, enter a base value (**Base Pnt n**) and the corresponding custom value (**Custom Pnt n**).

— NOTE

If you specified the **Custom Unit** as **User Defined**, you must define your unit prior to entering the number of points.

The points must be selected to maintain a positive or negative slope.

A maximum or minimum difference between successive concentrations is not required. The intervals need not be evenly spaced. IPS suggests 2 or 3 points be used in linear regions and more data points be used in curved or critical regions. See Figure 35.



Point	mS/cm	%
1	390	50
2	410	47
3	430	44
4	450	41
5	478	38
6	508	35
7	520	34
8	537	33
9	552	32
10	568	31
11	592	29
12	630	26
13	667	23
14	673	22
15	680	21
16	685	20

Figure 35. Configured Conductivity vs. Concentration Data

In the example used in Figure 34 and Figure 35, the 31 reference points were reduced to 16 configured points. The configuration procedure would have been as follows:

1. Specify your **Measure Unit** as **Custom** and **%**.
2. Specify the scale of your custom units. For this example, because they are from 50 to 20 percent concentration and the degree of accuracy is only required in whole units of percent, specify **Custom Scale** as **9999.**
3. Specify the **Base Units**. For this example, **mS/cm**.
4. Specify the scale of your base values. For this example, because they are from 390 to 685, specify **Base Scale** as **999.9**.
5. Specify the number of points (**Num of Pts**) on your curve. For this example, it is **16**.
6. Specify the sixteen point pairs.

— NOTE

When entering data, remember to check the ± sign at the left of your display.

Damping

This section of the structure asks you to specify the **Damping** response time (for 90% recovery from an input step). Choices are **None**, **5**, **10**, **20**, **40**, **120**, and **300** seconds. To increase damping, use a higher response time. Damping applies only to measurement data, not to temperature data.

Temp Comp

Refer to Figure A-6 on page 87.

Absolute conductivity measurements are affected by ion concentration and temperature (heat causes ions to have more mobility in solutions, often increasing their conductivity). Temperature compensation adjusts the measurement to a conductivity reading equivalent to that at the reference temperature. You should specify a compensation from those listed in Table 14 that represents your process application most closely. Information on each of the choices follows the table. If your application is not covered in the choices available, either the **Linear** coefficient or nonlinear **Custom** temperature compensation may be used. You can also select **Absolute** (no temperature compensation).

— NOTE

This parameter does not appear if **Meas Units** was configured as percent (**%**) since the analyzer applies the appropriate compensation automatically.

You are first asked to specify the mode as **Dilute NaCl**, **NaCl**, **NaOH**, **KOH**, **H2SO4**, **Oleum**, **Grn Liquor**, **Blk Liquor**, **H3PO4**, **HCl**, **HNO3**, **KCl**, **CH3COOH**, **HF**, **Linear**, **Custom**, or **Absolute**. The most recently configured entry appears on the display.

Table 14. Chemical Specific Temperature Compensations

Tempcomp Menu	Additional Information	Valid Temperature Range
Dilute NaCl	Dilute Sodium Chloride (25°C Ref)	0 to 200°C (32 to 392°F)
NaCl	Sodium Chloride (25°C Ref)	0 to 200°C (32 to 392°F)
NaOH 25°C Ref (0 - 15%) 50°C Ref (0 - 15%) 100°C Ref (0 - 20%)	Sodium Hydroxide	 0 to 121°C (32 to 250°F) 0 to 100°C (32 to 212°F) 0 to 121°C (32 to 250°F)
KOH	Potassium Hydroxide (25°C Ref)	10 to 40°C (50 to 104°F)
H2SO4 50°C Ref (99.5 - 93%) 30°C Ref (96 - 93%) 25°C Ref (0 - 25%)	Sulfuric Acid	 0 to 120°C (32 to 249°F) 20 to 90°C (68 to 194°F) 0 to 100°C (32 to 212°F)
Oleum 0 - 10% (65°C Ref) 42 - 18% (65°C Ref)		 32 to 120°C (89 to 249°F) 32 to 120°C (89 to 249°F)
Grn Liquor	Na_2CO_3 (85°C Ref)	35 to 95°C (96 to 204°F)
Blk Liquor	Na_2O (160°C Ref)	100 to 175°C (212 to 347°F)
H3PO4	Phosphoric Acid (25°C Ref)	5 to 90°C (40 to 200°F)
HCl	Hydrochloric Acid (25°C Ref)	0 to 120°C (32 to 250°F)
HNO3	Nitric Acid (25°C Ref)	0 to 115°C (32 to 240°F)
KCl	Potassium Chloride (20°C Ref)	0 to 25°C (32 to 77°F)
CH3COOH	Acetic Acid (25°C Ref)	4 to 121°C (40 to 250°F)

Table 14. Chemical Specific Temperature Compensations (Continued)

Tempcomp Menu	Additional Information	Valid Temperature Range
HF 0°C Ref (90 - 99.99%) 25°C Ref (0 - 30%)	Hydrofluoric Acid	 -20 to +208°C (-4 to +406°F) 0 to 50°C (32 to 122°F)

Dilute NaCl This compensation is based upon pure water with the neutral salt sodium chloride used as the contributor to conductivity. It can be used for measurements below 1000 µS/cm of conductivity samples with temperatures from 0 to 200°C (32 to 392°F). It uses a 25°C reference temperature. Use this compensation for "clean water" applications such as boiler feed, condensate, or RO (reverse osmosis) make up water.

NaCl This compensation is based upon water with the neutral salt sodium chloride considered as the main contributor to conductivity. It uses a 25°C reference temperature. It can be used for conductivity samples with temperatures from 0 to 200°C (32 to 392°F). Use this compensation for measurements above 1000 µS/cm. It is valid for applications as high as several hundred mS/cm (for example 0-25% NaCl).

NaOH These compensations are based upon the activity of sodium hydroxide dissolved in water (also referred to as caustic or lye). NaOH is also used in CIP (clean in place) operations, demineralization regeneration, and pretzel blanching. Three reference temperatures are offered: **25°C**, **50°C**, and **100°C**. Choose the temperature that most closely approximates your application. The **25°C** selection can be used for conductivity samples with temperatures from 0 to 121°C (32 to 250°F) and is optimized for concentrations between 0 and 15% NaOH. The **50°C** selection can be used for conductivity samples with temperatures from 0 to 100°C (32 to 212°F) and is optimized for concentrations between 0 and 15% NaOH. The **100°C** selection can be used for conductivity samples with temperatures from 0 to 121°C (32 to 250°F) and is optimized for concentrations between 0 and 20% NaOH (for example, white liquor at high temperatures).

KOH This compensation is based upon the activity of Potassium Hydroxide dissolved in water. Use this selection when potassium hydroxide is the primary constituent of the process. The correction is optimized for concentrations between 0 and 6% KOH. It can be used for conductivity samples with temperatures between 10 and 40°C (50 and 104°F). The reference temperature is 25°C.

H2SO4 These compensations are based upon the activity of sulfuric acid. Three reference temperatures are offered: **25°C**, **30°C**, and **50°C**. Choose the temperature that most closely approximates your application. The **25°C** selection can be used for conductivity samples with temperatures from 0 to 100°C (32 to 212°F) and is optimized for concentrations between 0 and 25% H_2SO_4. The **30°C** selection can be used for conductivity samples with temperatures from 20 to 90°C (68 to 194°F) and is optimized for concentrations between 99.5 and 93% H_2SO_4. The **50°C** selection can be used for conductivity samples with temperatures from 0 to 100°C (32 to 212°F) and is optimized for concentrations between 99.5 and 93% H_2SO_4.

Oleum This compensation is based upon the activity of sulfuric acid with dissolved SO_2. Use this selection when making measurements in Oleum. It can be used for conductivity samples with temperatures between 32 and 120°C (89 and 249°F). The reference temperature is 65°C (149°F).

Grn Liquor Green liquor is one of the liquors used in pulp and paper manufacturing. It is formed by adding smelt (recovered chemicals from the digester) to water. Use this selection when measuring conductivity in green liquor in lime slaking operations. It can be used for conductivity

samples with temperatures from 35 to 95°C (96 to 204°F). The reference temperature is 85°C (185°F).

Blk Liquor Black liquor is the spent cooking liquor from a sulfate digester in paper mills. Use this selection when measuring conductivity in black liquor as alkali. It can be used for conductivity samples with temperatures from 100 to 175°C (212 to 347°F). The reference temperature is 160°C (320°F).

H3PO4 Use this compensation when phosphoric acid is the acid constituent. Phosphoric acid is sometimes used in CIP (clean in place) operations. This selection can be used for measurements from 0 to 35% H_3PO_4 in conductivity samples with temperatures from 5 to 90°C (40 to 200°F).

HCl Use this compensation when hydrochloric acid is the main contributor to the conductivity. A common use of HCl is as a regeneration acid for anion resins. The acid is also used in steel pickling. This selection can be used for measurements from 0 to 15% HCl in conductivity samples with temperatures from 0 to 120°C (32 to 249°F).

HNO3 Use this compensation when nitric acid is the main contributor to the conductivity. A common use of HNO_3 is metal finishing. This selection can be used for measurements from 0 to 10% HNO_3 in conductivity samples with temperatures from 0 to 115°C (32 to 240°F). The reference temperature is 25°C.

KCl This compensation is based upon water with the neutral salt potassium chloride considered as the main contributor to conductivity. It can be used for measurements between 0 and 16% KCl in conductivity samples with temperatures from 0 to 25°C (32 to 77°F). The reference temperature is 20°C (68°F)

CH3COOH Use this compensation when acetic acid is the main contributor to conductivity. Acetic acid is sometimes used in CIP operations. This compensation can be used for conductivity samples with temperatures from 4 to 121°C (40 to 250°F) and is optimized for concentrations between 0 and 8% CH_3COOH.

HF These compensations are based upon the activity of hydrofluoric acid. HF is used in semiconductor, pickling, and etching operations. Two reference temperatures are offered: **0°C** and **25°C**. Choose the temperature that most closely approximates your application. The **25°C** selection can be used for conductivity samples with temperatures from 0 to 50°C (32 to 122°F) and is optimized for concentrations between 0 and 30% HF. The **0°C** selection can be used for conductivity samples with temperatures from -20 to +208°C (-4 to +406°F) and is optimized for concentrations between 90 and 99.99% HF.

Absolute This selection means that there is no temperature compensation applied.

Linear Use this compensation for a simple binary solution or when other compensation choices are not appropriate for your application. By entering a linear slope value, between 0.5 and 5%/°C that is representative of your solution's conductivity change with temperature, your analyzer multiplies the factor entered by the temperature deviation times the absolute conductivity. Therefore, if you selected **Linear**, enter the reference temperature (**Ref Temp**) and specify the slope of the linear compensation curve (**Lin Slope**) between 0.5 and 5.0 %/°C.

Custom As with custom measure units, custom temperature compensation requires an explanation before you choose this selection. To prepare a temperature compensation curve, you must select a solution of typical concentration and measure its conductivity in precisely controlled temperature increments. The concentration is usually about 70% of the defined range. For example, if the range is 50 to 23% NaOH, the selected typical concentration might be 30%.

However, if there was a concentration critical to the process, then that would be used. The accuracy of the temperature concentration curve is related to the precision of the conductivity measurements at each temperature and the number of data points. A temperature compensation curve of two points would provide only limited compensation. If the process temperature were known to vary between 100 and 170°F, then the conductivity could be measured in 10 degree increments from 90 to 180°F.

After you have done this preparation, select **Custom** as your type of temperature compensation. Then, the prompts ask you to specify a reference temperature (**Ref Temp**) and a number of points to plot a compensation curve. The process-specific compensation data must be generated or extracted in advance of entering it into the analyzer. We suggest that the data be plotted graphically as well as tabularly to prepare it for entry into your analyzer.

In entering the data, the number of points (**Num of Pts**) can be specified from 2 to 21 points. Each point specifies a conductivity value at a certain temperature. The **Temp/Pnt n** temperature units (Celsius or Fahrenheit) are specified under "Temp Unit" on page 44. The **Value/Pnt n** can be specified from 0 to five times the scale value chosen.

NOTE

When entering data, remember to check the ± sign at the left of your display.

The data should be input to the analyzer with increasing values of temperature.

NOTE

1. The temperature values must be entered in increasing or decreasing order or the display will read **Slope Error**.
2. Actual database saving of the compensation table is not performed until the last point pair is entered.

A maximum or minimum temperature difference between successive temperatures is not required. It is recommended that the data points be equally spaced in the anticipated temperature range.

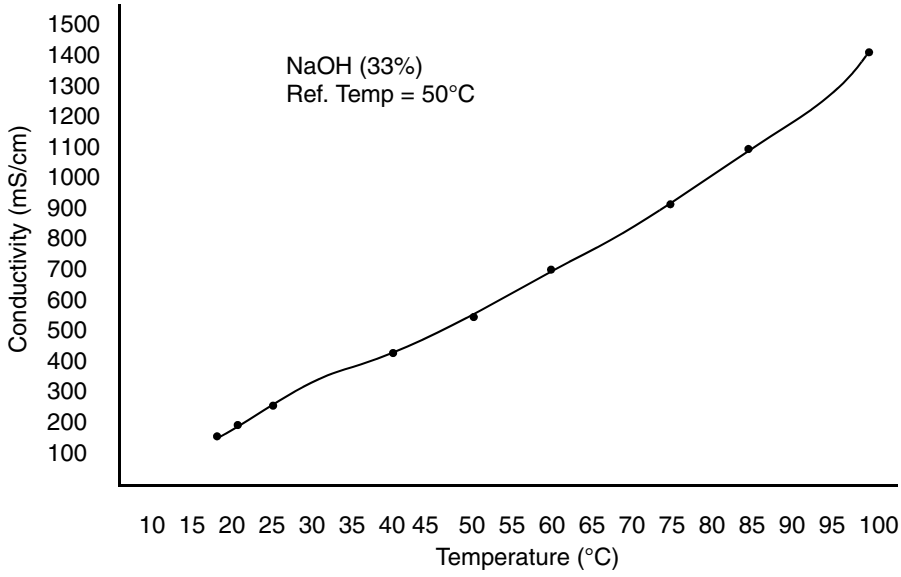


Figure 36. Configured Conductivity vs. Temperature Data

In the example used in Figure 36, the configuration procedure is as follows:

1. Specify the reference temperature. For this example, 50°C.
2. Specify the number of points on your curve. For this example, it is 9.
3. Specify the nine point pairs.

Display

(Refer to Figure A-7 on page 88.)

In Measure mode, the display normally shows the information configured in this section. First you must specify the **Line Mode**. The choices are:

- **Single:** The measurement title, value, and unit are displayed. If more than one application is configured, the application number replaces the measurement title. The bar graph shows the percent of the configured range of the value on the display.
- **Dual:** Two measurement titles, values, and units are displayed. If more than one application is configured, the application number replaces the Line 1 measurement title. The bar graph shows the percent of the configured range of the Line 1 value on the display.
- **Scan:** Several measurements can be selected to show in sequence on the display in a designated scan time. When the analyzer is in Scan mode, the bar graph is inactive.

If in **Single Line Mode**, you must select in the **Line** parameter the measurement you want shown on the display. If in **Dual Line Mode**, you must select in the **Line 1** and **Line 2** parameters the measurements you want shown on the display. Choose from the selections in Table 15.

Table 15. Display Configuration

Selection	Description
Measurement	The conductivity measurement
Temperature	The temperature measurement
Absolute	The absolute value of the measurement in conductivity units
Analog 1	Analog Output 1
Analog 2	Analog Output 2 (or HART analog output if installed)

Next, enter the minimum (**Bargraph Min**) and maximum (**Bargraph Max**) bar graph values for the measurement you selected in **Line** or **Line 1**. See Table 16 for the scale and units that apply to each selection.

Table 16. Bar Graph Configuration

Selection	Unit	Scale
Measurement, Absolute	Per Measure Unit on page 45	Per Scale on page 45
Temperature	Per Temp Unit on page 44	-1000 to +1000 by 0.1 if °C -1960 to +1960 by 0.1 if °F

If in **Scan Mode**, you must specify which measurements or calculations you want to display in sequence (**Scan Data**) and the **Scan Time**. The Scan Data selections are from the list shown in Table 15. The **Scan Time** choices are **2**, **5**, **10**, and **20** seconds.

Choices are selected or deselected by presenting a choice on the display and pressing the **Enter** key. The selected choices appear on the menu preceded by a check mark (√). When you have finished making your selections, choose **Exit**.

Analog 1 and Analog 2

Refer to Figure A-8 on page 89.

There are two analog outputs in the analyzer, **Analog 1** and **Analog 2**. All analog outputs are configured independently. On power-up and after configuration changes, the output reflects the fail-safe value as configured until the analyzer has stabilized and has passed the first damping factor.

This section of the structure enables you to specify what measurement each analog output reflects, the minimum and maximum range values for the outputs just specified, and a fail-safe signal for each output.

Measurement

For each analog output (**Analog n**), specify the 4 to 20 mA output to represent one of the following measurements or calculations: **Measurement**, **Temperature**, or **Absolute**. You can also specify **Off** if you are not using the output.

Output Range

The nominal output measurement currents are 4 mA and 20 mA. Both can be configured to any measurement value. When the 4 mA level represents the measurement highest value and 20 mA represents the measurement lowest value, the outputs are reverse acting.

Enter the minimum (**Min mA/Ana n**) and maximum (**Max mA/Ana n**) range values for the output just specified. See Table 16 for the scale and units that apply to each selection. There must be a minimum difference of 5% between the minimum and maximum values. The analog output range can be set up to approximately five times the primary scale chosen.

In situations of multiple applications (**Number of Apps** >1), you must enter the minimum (**Min mA/App n/Ana n**) and maximum (**Max mA/App n/Ana n**) range values for each application and the mA output (**mA min/App n/Ana n** and **mA max/App n.Ana n**) at those range values. For example, application 1 could be configured for an output of 4 to 7 mA, application 2 for 7 to 12 mA, and application 3 for 12 to 20 mA.

Fail-Safe Output

A fail-safe output is delivered for all analyzer faults and for critical cell diagnostic faults when so configured. Select **Off** under **Failsafe/Ana n** to disable this feature. Select **On** to specify a fixed output when in a failed condition. Select **Pulse** if you want to have this signal outputted with a pulsed saw-tooth waveform of 0.5 mA (as shown below) for greater visibility on a chart recorder or data display. The waveform has a frequency of 10 Hz with 10 steps of 0.1 mA increments.



If **On** is selected, further specify the **DC mA/Ana n** output between 3.8 and 20.5 mA. If **Pulse** is selected, further specify the **Average mA/Ana n** output between 3.8 and 20.5 mA.

An example of how to use this feature follows.

Suppose you are using your 4 to 20 mA signal to control a valve that diverts high conductivity water. You also wish to divert the flow if the measurement system is suspect due to a configuration fault. To configure your analyzer to do this:

1. Configure your output so that 20 mA is the upper limit of acceptable water before diverting flow.
2. Configure **Failsafe/Ana 1** as **On** and set the **DC mA/Ana 1** value as 20.5.
3. In **Diagnostic**, enable the **4-20 Range**, **Comp Rng**, and **Meas Rng** selections and disable the **Leakage**, **ATC Open**, and **ATC Short** selections.

HART Analog

Refer to Figure A-9 on page 90.

The analyzer can have an optional communication module that allow measurement, status, and configuration information to be exchanged between the analyzer and the connected host. HART is one of these modules.

The **HART Analog** parameter enables you to specify what measurement the analog output reflects, the minimum and maximum range values for the output just specified, and a fail-safe signal for the output. See "Analog 1 and Analog 2" on page 59 for an explanation of how to configure these parameters.

NOTE

1. The **Failsafe (HART)** parameter does not have a **Pulse** option.
2. To configure your HART digital communication parameters, see "HART Digital" on page 66.

HART Digital Outputs

The analyzer can have an optional communication module that allow measurement, status, and configuration information to be exchanged between the analyzer and the connected host. HART is one of these modules.

There are four HART measurements:

HART Measurement	875 Configuration Parameter
Primary Variable (PV)	Analog 1
Secondary Variable (SV)	HART Analog
Tertiary Variable (TV)	HART TV
Fourth Variable (FV)	HART FV

HART PV (Analog 1)

The primary variable (PV) is the measurement configured for Analog 1. Analog 1 can be configured to represent **Measurement**, **Temperature**, or **Absolute** measurements. It is frequently configured to **Measurement**. You can also specify **Off** if you are not using this output.

HART SV (HART Analog)

The secondary variable (SV) is the measurement configured for HART Analog. Hart Analog can be configured to represent **Measurement**, **Temperature**, or **Absolute** measurements. It is frequently configured to **Temperature**. You can also specify **Off** if you are not using this output.

HART TV

The tertiary variable (TV) can be configured to represent **Measurement**, **Temperature**, or **Absolute** measurements. It is frequently configured to **Absolute**. You can also specify **Off** if you are not using this output.

HART FV

The fourth variable (FV) can be configured to represent **Measurement**, **Temperature**, or **Absolute** measurements. You can also specify **Off** if you are not using this output. It is usually configured to **Off**.

Auto Service

Refer to Figure A-10 on page 91.

The analyzer Auto Service feature enables automating the process of calibrating sensors. When activated, the analyzer sends a signal to a (user-supplied) control instrument which sequences the removal of the sensor from the process, its calibration, and reinstallation, all automatically.

— NOTE

The Auto Service feature is only available if **Number of Apps** = 1.

To configure this feature, first specify the type of auto service desired. The choices are **1 Point Offset**, **1 Point Span**, **2 Point Sol**, and **2 Point Bench**. The type can also be set to **Off**.

— NOTE

When **Auto Service Type** is set to any type other than **Off**, **Alarm 1** is reserved for the auto service feature and does not appear in the configuration menu.

Methods of Initiation

Next specify the method or methods to **Initiate** the auto service. The choices are **Manual** (from the analyzer keypad), **Signaled** (by an input trigger), **Scheduled** (by a set date or period), and **All Selects** (all of the above). Choices are selected or deselected by presenting a choice on the display and pressing the **Enter** key. The selected choices appear on the menu preceded by a check sign (√). When you have finished making your selections, choose **Exit**.

If you selected **Signaled**, you must specify the **Input Trigger** as **High** or **Low**. If **High**, Auto Service is initiated when input switch DI4 is closed. If **Low**, it is initiated when the input switch is open.

If you selected **Scheduled**, you must select the schedule. The choices are **Daily**, **Weekly**, **Monthly**, **Period by Days**, and **Period by Hours**. If you selected **Weekly** or **Monthly**, you must specify the days of the week (**All Days** or **Monday**, **Tuesday**, ... **Sunday**) or the days of the month (**All Days** or **1**, **2**, **3**, ...**28**) respectively. Choices are selected or deselected by presenting a choice on the display and pressing the **Enter** key. The selected choices appear on the menu preceded by a check sign (√). When you have finished making your selections, choose **Exit**. If you selected **Daily**, **Weekly**, or **Monthly**, you must specify the **Time of Day**.

If you selected **Period by Days**, you must specify the **Period of Day** from 1 to 365. For example, to do the procedure once every 10 days, select 10. If you selected **Period by Hours**, you must specify the **Period of Hour** from 1 to 8760. For example, to do the procedure once every 8 hours, select 8. In both cases, you must also specify the **Start Date** from 1/01/9999 to 12/31/2098 and the Start Time from 00:00 to 23:59.

Calibration Solution

In you selected a solution calibration, you must specify the **Solution Value** for a one-point calibration or **Solution Value 1** and **Solution Value 2** for a 2-point calibration. The value can be 0 to full scale.

Calibration Times

Next you must establish times for the various steps in the auto service procedure. The **T1 Setup Time** is the time for cleaning, purging, and setup. Next is the **T2 Hold Time** (time in Solution 1) and **T3 Setup Time** (for cleaning, purging, and set up). Lastly is **T4 Hold Time** (time in Solution 2) and **T5 Setup Time** (for cleaning, purging, and set up) if you are doing a 2-point calibration. The Setup and Hold times can be set from 15 to 999 seconds.

Trip State and Hold

Lastly, specify the **Trip State** as **Energized** or **Deenergized**. Also specify the **Hold** parameter as **Off**, **On Present** (to hold all values and states at their present level) or **On Manual** (to set all values and states at the levels specified in Hold mode).

Alarm 1, Alarm 2

Refer to Figure A-12 on page 93.

The analyzer has two sets of alarm contacts. Each is configured independently. On power-up and after configuration changes, alarm action is inhibited until the analyzer has stabilized and has passed the first damping factor. The alarm output may not be in the desired state until that time.

Measurement/Calculation/Condition

For each alarm (**Alarm n**), specify the alarm to one of the following measurements or conditions: **Measurement**, **Temperature**, **Absolute**, or **On Fault**. You can also specify **Off** if you are not using the alarm.

Alarm Activation

Next, specify in **Trip n** if you want the alarm to be:

- **Trip Low**: Active (energize relay) on a low going condition
- **Trip High**: Active (energize relay) on a high going condition

Specify the trip point (**Set Point n**) value. This is in the units previously configured and within the scale previously specified. Then specify **Control n** as **Hysteresis** or **Timed**. Both are used to minimize chatter around the setpoint. **Hysteresis** does this by using the measurement; **Timed**, by using time. If **Control n** is specified as **Hysteresis**, enter the hysteresis value. If you choose not to use either hysteresis or timed control, select **Hysteresis** and set the hysteresis value to zero.

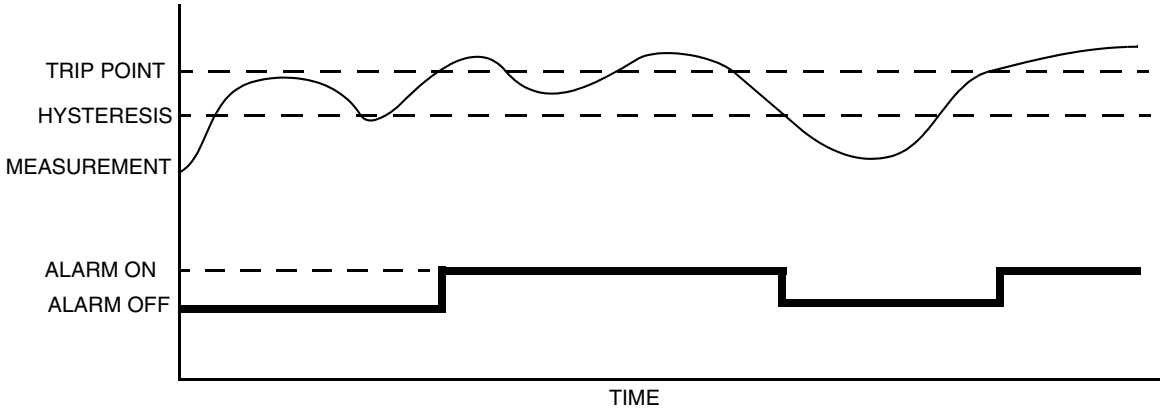


Figure 37. High Alarm with Hysteresis

If **Control** is specified as **Timed**, three timers are involved in the alarm:

- A **Trig Time n** (trigger time) wherein the condition must exist continuously for at least this time period before the alarm condition is met
- An alarm **On Time n** (feed time)
- An alarm **Off Time n** (delay time) before the alarm can trigger again.

The values can be set from 00.00 to 99.99 minutes.

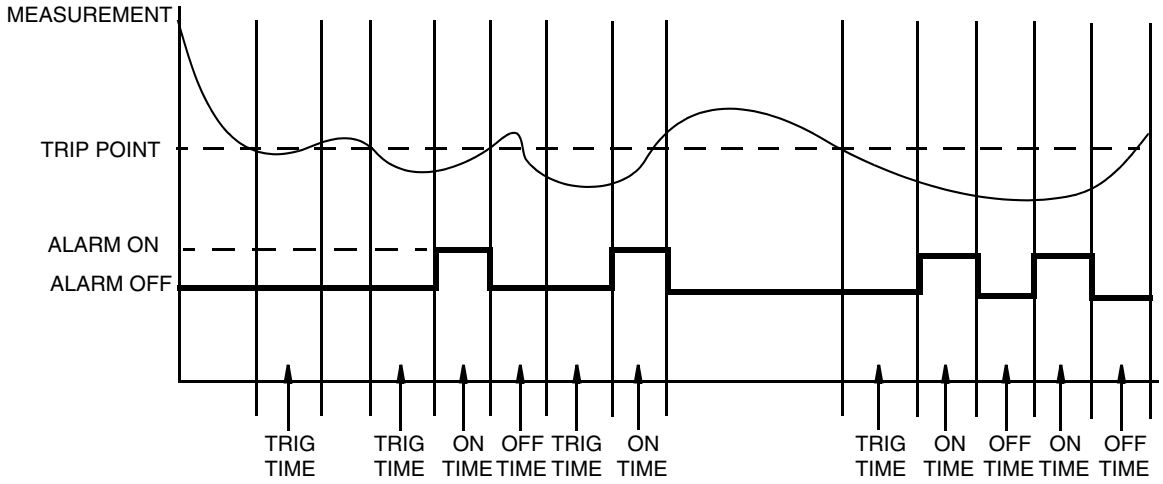


Figure 38. Timed Low Alarm

If you are logged on at Passcode Level 1, you are asked to specify the alarm fault action. If you are not logged on at Passcode Level 1, the structure advances you to the next parameter, **Trip State**. Set **Alm Fault Act** as **Meas Value**, **Meas and Fault**, or **Valid Meas**.

Meas Value enables an alarm only when the measurement exceeds the alarm setpoint.

Meas and Fault enables an alarm when the measurement exceeds the setpoint and/or if one of the selected faults are present. You can select the **Faults** that you want to activate the alarm. The choices are **All Faults**, **Analyzer Faults**, **Comm Faults**, **Leakage**, **ATC Short**, **ATC Open**, **4-20 Range**, **Comp Range**, and **Meas Range**. Choices are selected or deselected by presenting a choice on the display and pressing the **Enter** key. The selected choices appear on the menu preceded by a check mark (√). When you have finished making your selections, choose **Exit**.

Valid Meas validates the cause when the measurement exceeds the setpoint. If the cause is a fault and not process related, the alarm is disabled.

Lastly, specify the **Trip State** as **Energized** or **Deenergized**. In an alarm condition, **Energized** provides a contact closure between 1C and 1NO (2C and 2NO) and an open contact between 1C and 1NC (2C and 2NC); **Deenergized** provides a contact closure between 1C and 1NC (2C and 2NC) and an open contact between 1C and 1NO (2C and 2NO). To provide alarm capability on loss of power, select **Deenergized**.

— NOTE

The way you configure the alarm trip state must be done in conjunction with the way you wire the external device to the analyzer. See “Alarm Wiring” on page 20.

Run Application

Refer to Figure A-13 on page 94.

— NOTE

1. This parameter appears only if the number of applications set in **Number of Apps** was more than 1.

2. Each application must have been previously configured. Activating a nonconfigured application has no effect.

If, in using the analyzer, you wish to change from one application to another, you can specify the application number as **1**, **2**, or **3** in **Run Application**. The entire application switches to that preconfigured application.

You can also specify **Auto** instead of an application number, and the analyzer switches from one application to another when triggered by measurements above or below established limits.

- When the measurement value exceeds the **App 1 Hi** preset, **App 2** runs.
- When the value then exceeds the **App 2 Hi** preset, **App 3** runs.
- When the value decreases below the **App 3 Lo** preset, **App 2** runs.
- When the value decreases below the **App 2 Lo** preset, **App 1** runs.

If you specify **Auto**, you must establish the presets which trigger movement from one application to another. Therefore, specify the values of **App 1 Hi**, **App 2 Lo**, **App 2 Hi**, and **App 3 Lo**. These values must be entered in the measurement units chosen for the application. It is assumed that although the ranges of the applications must overlap, application 1 has the lowest conductivity value, application 2 is next, and application 3 has the highest. The switching from one application to another only takes a few seconds and once a switch is made, another switch can occur within a few seconds.

Lastly, the analyzer can be configured to change applications from an external device connected to the analyzer signal inputs. When one of the three application switching inputs DI1, DI2, or DI3 changes from inactive to active state, the corresponding application 1, 2, or 3 is activated. When first configured, operation starts with the lowest configured application. To use this feature, set **Run Application** to **Signal.** Then, set the active state **Level** as **Direct** or **Inverted**. If **Direct**, the application becomes active when the input switch closes. If **Inverted**, it becomes active when the input switch opens. For example, if you wanted to switch applications based on temperature instead of conductivity, you could wire terminal **DI1** to terminal **1C** and terminal **1NO** to terminal **DI2** (see Figure 7). Then, configure **Alarm** to **Temperature** and **Run Application** to **Signal**.

Remote

Refer to Figure A-14 on page 94.

The analyzer can be operated via a remote personal computer program on a PC operating on Windows 95, Windows 98, Windows NT, or Windows 2000. To enable this capability, several parameters must be configured in this section of the structure.

First, in **Remote Options**, select **Port**. Then, set the **Baud Rate** to **300**, **600**, **1200**, **2400**, **4800**, **9600**, **19200**, or **Off**. Then set **Data Parity** to **7 Odd**, **7 Even**, **8 Odd**, **8 Even**, or **8 None** and **Stop Bits** to **1** or **2**.

Next go back to **Remote Options** and select **Update**. Then set the **Update** frequency as every **5**, **10**, **30**, **60**, **120**, **300**, **600**, **1200**, or **3600** seconds. You can also set this parameter to **Off**. The analyzer updates the remote port with measurement information at the configured update rate.

HART Digital

Refer to Figure A-15 on page 94.

This section of the structure enables you to specify your HART digital communication parameters. First, specify the **Poll Address** of 0 to 15. Then, specify the **Preambles** value of 5 to 255.

— NOTE

To configure your HART analog output, see"HART Analog" on page 60.
To configure your HART digital output, see "HART Digital Outputs" on page 60.

Cal Parameters

Refer to Figure A-16 on page 95.

Measurement and Temperature Stability

When performing a calibration (see "Calibration Mode" on page 34), the analyzer checks for stability in absolute measurement (**Meas Stability**) and temperature (**Temp Stability**) before accepting a change. This section enables you to configure the time (**Stability Time**) allowed to attain stability and the amount of fluctuation (**Stability Var**) allowed during the calibration. The value of **Stability Var** corresponds to the least significant digit of the measurement in the **Scale** you configured on page 45. Both **Stability Time** and **Stability Var** are configured individually in **Meas Stability** and **Temp Stability**.

First, configure **Meas Stability** as **On** or **Off**. If you configure this as **On**, you need to specify the **Stability Time** between 5 and 60 seconds (in 5-second increments) and the **Stability Var** between 1 and 9. A longer time period and a smaller measurement value assures more stability during calibration.

— NOTE

In specifying the **Stability Var**, the numbers 1 through 9 refer to the last digit of the primary scale; for example,

If scale is 20.00 mS, an **Stability Var** value of 5 means 0.05 mS
If scale is 100.0 µS, an **Stability Var** value of 5 means 0.5 µS.

Thus, if the Scale is 20.00 mS, and a stability time of 5 and allowed fluctuation of 9 are used, the values can change at a rate of 0.09 mS over 5 seconds.

Then repeat the procedure for **Temp Stability**. If you configure this as **On**, you need to specify the **Stability Time** between 5 and 60 seconds (in 5-second increments) and the **Stability Var** between 1 and 9 (°C or °F).

Local ac Power

If your analyzer was ordered to use 24 V dc supply voltage, you must specify **Local ac Power** as 50 or 60 Hz in order to best filter the readings. This can be done from the front panel display or the PC-Based configurator. It cannot be done from a HART Communicator.

Automatic Hold

Refer to Figure A-17 on page 95.

This parameter enables you to configure your analyzer to go into a Hold state whenever you are in Calibration or Configuration mode without setting the Hold each time. It also automatically removes the Hold when you leave Calibration or Configuration mode. To configure this parameter, specify **Automatic Hold** as **Present** to hold all values and states at their current level, **Manual** to set all values and states at the levels specified in Hold mode, or **Off**, if you choose not to use this feature.

Diags

Refer to Figure A-18 on page 95.

This section of the structure allows you to configure fault messages that can appear on your display. You can elect to enable or disable **All Diags** messages, or enable or disable each of the following individually: **Leakage**, **ATC Short**, **ATC Open**, **4 - 20 Range**, **Comp Range**, and **Meas Range**. Each of these is discussed below. A typical approach is to initially disable **All Diags** messages and to enable selected messages later when you find out that you require them.

Choices are made by presenting a selection on the display and pressing the **Enter** key. The enabled choices appear on the menu preceded by a check sign (√).

Diagnostics that are enabled and triggered can also force a fail-safe analog output signal, if desired. See “Analog 1 and Analog 2” on page 59.

Leakage

This message reports a problem of severe liquid leakage into the sensor which causes an ATC short to a measurement electrode. The message can be enabled or disabled. A **Sensor Fault** message is displayed if this diagnostic is enabled and this fault occurs.

ATC Short, ATC Open

This message reports a problem if the resistance of the temperature compensator is greater or less than the expected resistance of the device configured. The message for each can be enabled or disabled. A **Sensor Fault** message is displayed if this diagnostic is enabled and this fault occurs.

4 - 20 Range

This message reports that the measurement tied to the analog output (measurement, absolute measurement, or temperature) is outside the range configured for the currently running application. The message can be enabled or disabled. A **Configuration Fault** message is displayed if this diagnostic is enabled and this fault occurs.

Comp Range

This message reports that the measured temperature or absolute conductivity measurement is outside the temperature or chemical compensation curve configured for the currently running application. The message can be enabled or disabled. A **Configuration Fault** message is displayed if this diagnostic is enabled and this fault occurs.

Meas Range

This message reports that the measurement is over or under the measurable range that is configured for the currently running application. The message can be enabled or disabled. A **Configuration Fault** message is displayed if this diagnostic is enabled and this fault occurs.

Timeouts

Refer to Figure A-19 on page 95.

This section of the structure asks you to specify the time in which the instrument brings you back to the Measure mode from another on-line mode (Status, Diagnostics, or Configuration) when no keyboard input has occurred. In Measure mode, **Timeouts** also limits the time to view a secondary display other than that configured in "Display" on page 58. The timeout can be configured separately for front panel (**Front Panel Timeout**), remote (**Remote Timeout**), and digital communication (**Dig Comm Timeout**) operation. The time can be specified between 5 and 999 seconds.

Date and Time

Refer to Figure A-20 on page 96.

The analyzer contains a real-time clock device that maintains the correct time and date even with loss of power.

To configure this parameter, enter the **Date** in the form MM/DD/YYYY and the **Time** as HH:MM. The time is on the basis of 24 hours.

Analyzer Names

Refer to Figure A-21 on page 96.

This section of the structure asks you to identify your analyzer. You can specify its Tag Number, Tag Name, Location, and Device Name. Each can be up to the following number of characters in length:

Tag Num	12 characters
Tag Name	16 characters
Location	14 characters
Dev Name	8 characters

These identifications then appear in Status mode.

Passcode

Refer to Figure A-22 on page 96.

Analyzer security is provided by the use of passcodes. This is described in detail in "Passcode Access" on page 24. The passcodes for the three levels of security can be established in this parameter. Enter the passcode for **Level 1**, **Level 2**, and **Level 3**. Each can be from 0000 to 9999.

LCD Adjustment

Refer to Figure A-23 on page 96.

You can adjust the brightness on your display. Do this, in this section of the structure, by changing the **LCD Adjust** number using the **Up** and **Down** arrow keys. The numbers (-9 to 0 to +9) shown on the display should only be used as an indication of where you are in the range of adjustment. Use the **Up** arrow key to darken the display and the **Down** arrow key to lighten it. When the display brightness is pleasing to your taste, press **Enter**.

Factory Defaults

Refer to Figure A-24 on page 96.

At the display **Config to Defaults**, you can leave the parameters as presently set by selecting **Exit to Primary**. Alternatively, you can reset your configuration back to the factory default settings by selecting **Load Defaults**. The factory default settings are shown in bold print in Appendix B. If you do the latter, you are asked **Are You Sure?** Respond with the **Yes** or **No** key.

⚠ CAUTION

Loading factory defaults permanently removes your present configuration.

Diagnostic Mode

The Diagnostic mode enables you to:

- View pending faults and temporarily suspend those faults
- Resume any suspended faults
- View the diagnostic history log
- Send the history log to a remote port
- Erase the history log.

To enter the Diagnostic mode, press the **Mode** key until the **Diag** indicator is illuminated. Press **Enter**. Use the **Mode** key to exit Diagnostic mode and go to Measure mode. If there are no key presses within the configured Timeout period, the analyzer reverts to Measure mode and the outputs remain on hold.

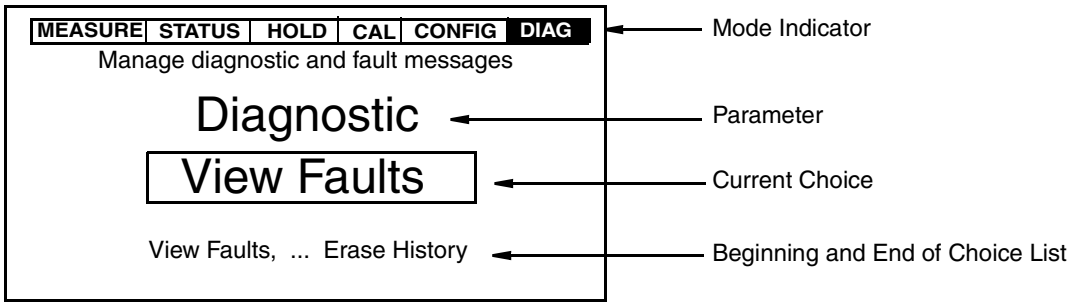


Figure 39. Sample Diagnostic Screen

Figure 40 shows the top-level Diagnostic mode structure diagram.

Select **View Faults** to view and possibly suspend each fault. Use the **Up** and **Down** (or **Right**) arrow keys to view other faults. If there are no faults, the display reads **No Faults**. Press the **Enter** key to suspend a displayed fault. The display asks for your passcode. An incorrect passcode returns you to the start of the Diagnostic menu. A correct passcode causes the prompt **Suspend Fault?** to be displayed. If you answer **Yes**, the message **XXXXX Suspended** is displayed where **XXXXX** is the name of the fault that was displayed. After either a **Yes** or **No** reply, the next fault is shown. When all faults have been suspended or if there are no faults, the message **No Faults** appears. Each suspended fault is inhibited from reoccurring for one hour from the time the Diagnostic mode is entered.

Select **Resume Faults** to resume any suspended faults.

Select **View History** and use the arrow keys to view the diagnostic history.

Select **Demand Report** to send the history log out to a remote port. To do this, connect the RS-232 port on your analyzer to your printer or a serial port on your computer. If you are downloading the report to a computer, use the Hyperterminal accessory. Make sure the port settings on your computer match those on your analyzer. See “Remote” on page 65.

If you are downloading the report to a printer, the printer must be a “serial port” printer and have continuous paper feed. If you do not have this type of printer, you can download the report to a computer and then print it.

Select **Erase History** to erase the history log. This function is passcode protected. If you are not already in Level 1, the display asks for the Level 1 passcode. An incorrect passcode returns you to the start of the Diagnostic menu. A correct passcode causes the message **History Erased** to appear.

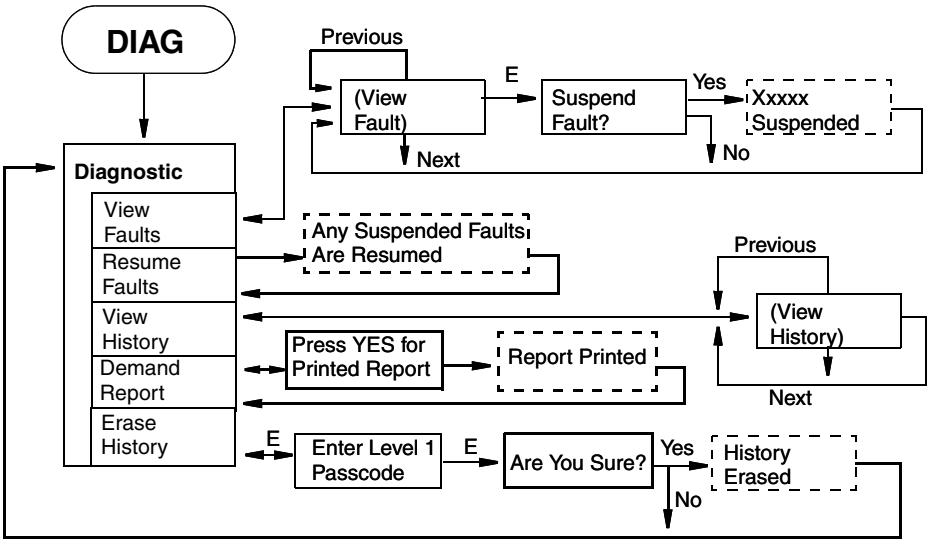


Figure 40. Top Level Diagnostic Mode Structure

Remote Data Logging

The 875 Analyzer is designed to allow its RS232 serial port to be connected to a remote printer having RS232 input. All fundamental measurements are reported to the RS232 port in a printable format at periodic intervals. The exact interval is selected in the Configuration Mode (see "Remote" on page 65). The first report is made immediately after power up, any calibration, or any configuration change. Thereafter the update rate is used.

Connection between the 875 Analyzer and the printer is made with a 3 m (10 ft) Serial Cable BS809WH, which has a connector at one end for plugging into the 875 Analyzer RS232 port and a standard DB9 connector at the other end that is suitable for plugging directly into a PC port. Different printers have different connectors and any adaptors or null modems required between the DB9 and the printer must be supplied by the user. The 875 Analyzer remote settings must be configured to match the printer's RS232 settings (for example, baud rate).

— NOTE

Because the **UNCERTAINTY** and **MV STATUS** fields in the printout are not implemented at this time, they show an output of **?**.

You can similarly use a PC and dumb terminal program (for example, Hyperterminal) to produce an electronic log of 875 Analyzer measurements. As with the printer, the above mentioned serial cable is required and the RS232 settings in the terminal program must match those in the 875 Analyzer Remote configuration. Once the 875 Analyzer measurements start appearing in the dumb terminal window, simply use the program's log-to-file function to record them in the PC.

The standard format recorded in this way is difficult to use in a spreadsheet. Therefore, the firmware in the 875EC Analyzer has an additional configuration parameter to select the report

format for a **Printer** or **Spreadsheet** (See Figure A-14). The spreadsheet option produces a single line per update with all values separated by commas to generate a Comma Separated Variable (.CSV) format recognized by most spreadsheets. It is recommended that such a log file be created with a .CSV extension. This format is difficult to read unless it is imported into a spreadsheet program. The columns are:

Tag
Date,
Time,
Hold State,
Fault Severity (0=OK, 1=warning, 2=soft, 3=hard),
Active Measurement,
Measurement Units,
Active Temperature,
Temperature Units,
Active Absolute Measurement,
Absolute Units,

Once a set of .CSV updates is imported into a spreadsheet, it is easy to make trend plots or other calculations.

6. Operation Via HART Communicator

Description

The 875 Series Analyzers with HART communications may be configured, operated, and calibrated using the HART Communicator.

The HART Communicator is used in two environments: Offline (not connected to an analyzer) and Online (connected to an analyzer). The Main menu (shown in Figure 41) is displayed when not connected to an analyzer. The Online Menu (shown in Figure 42) is displayed when connected to an analyzer.

Overview of Top Level Menus

Figure 41 shows the Main menu structure of the HART Communicator. Figure 42 shows the top level Online menu for the 875 Series Analyzers.

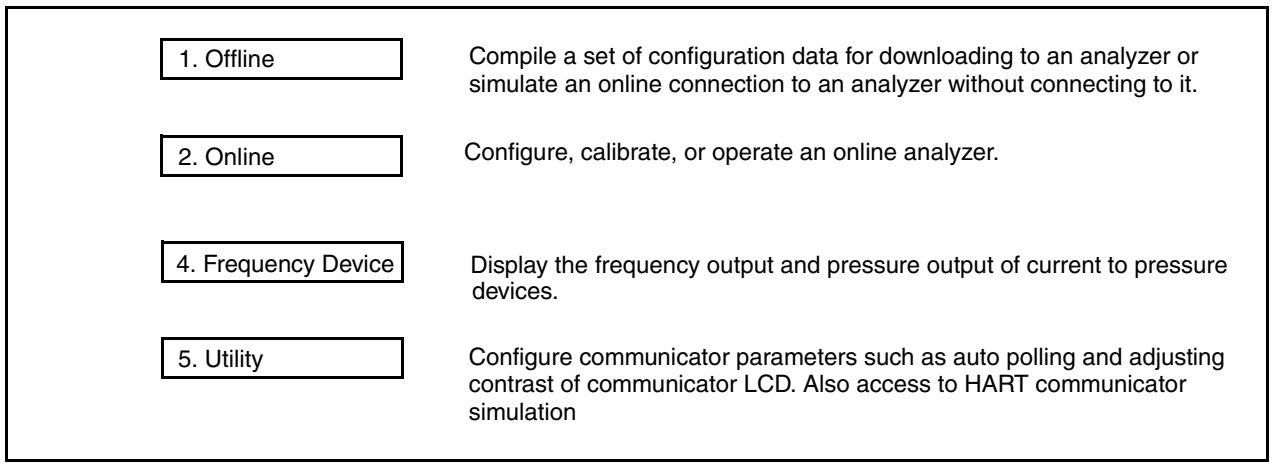


Figure 41. HART Communicator Main Menu

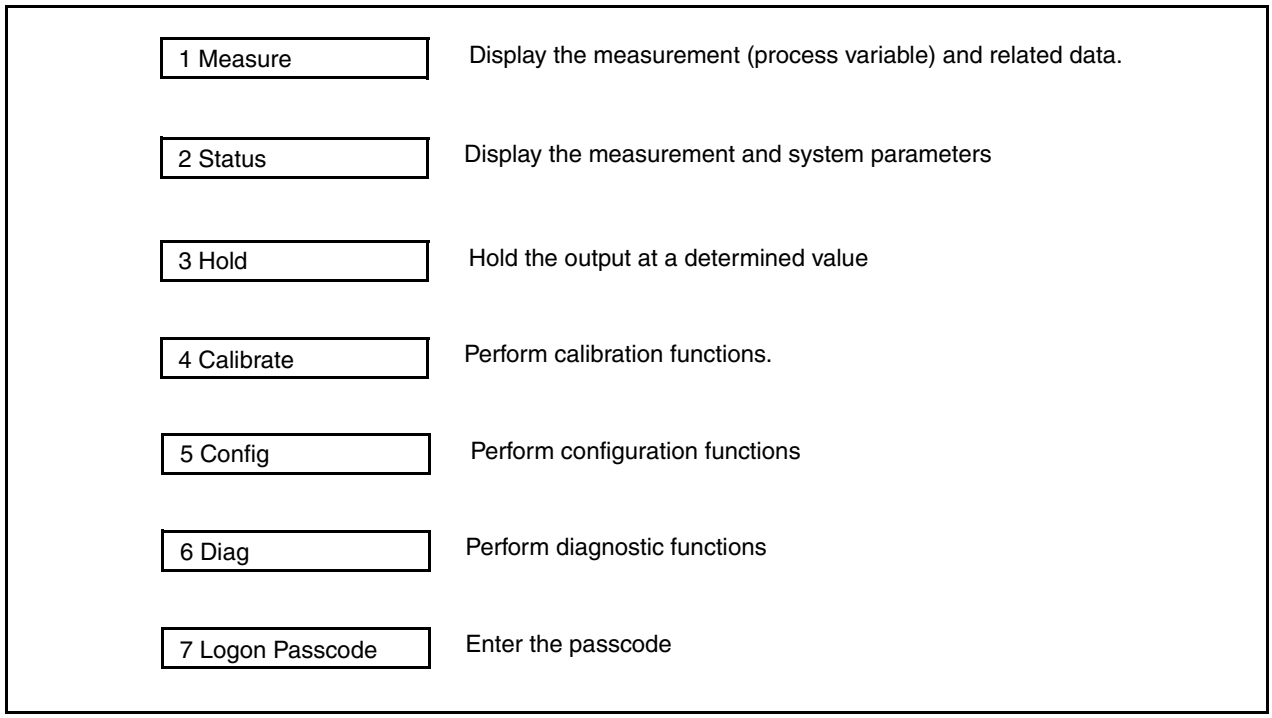


Figure 42. 875 Series Analyzers Top Level Online Menu

Connecting the Communicator to the Analyzer

Connect the HART communicator to the COM1(+) and COM2(-) terminals of the analyzer that are shown in Figure 7 or any other convenient place in the loop. There must be a minimum 250 Ω load in the loop. Therefore, if you are configuring the analyzer on the bench (no loop load) with a HART communicator, you must add a 250 Ω resistor.

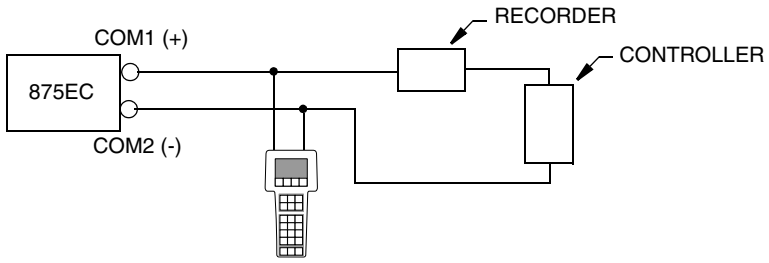


Figure 43. HART Communicator Connection

Communicator Keyboard and Display

Refer to the HART user manual supplied with the communicator.

Offline Configuration

The offline configuration feature is not available at this time.

Online Configuration

Online Flowchart

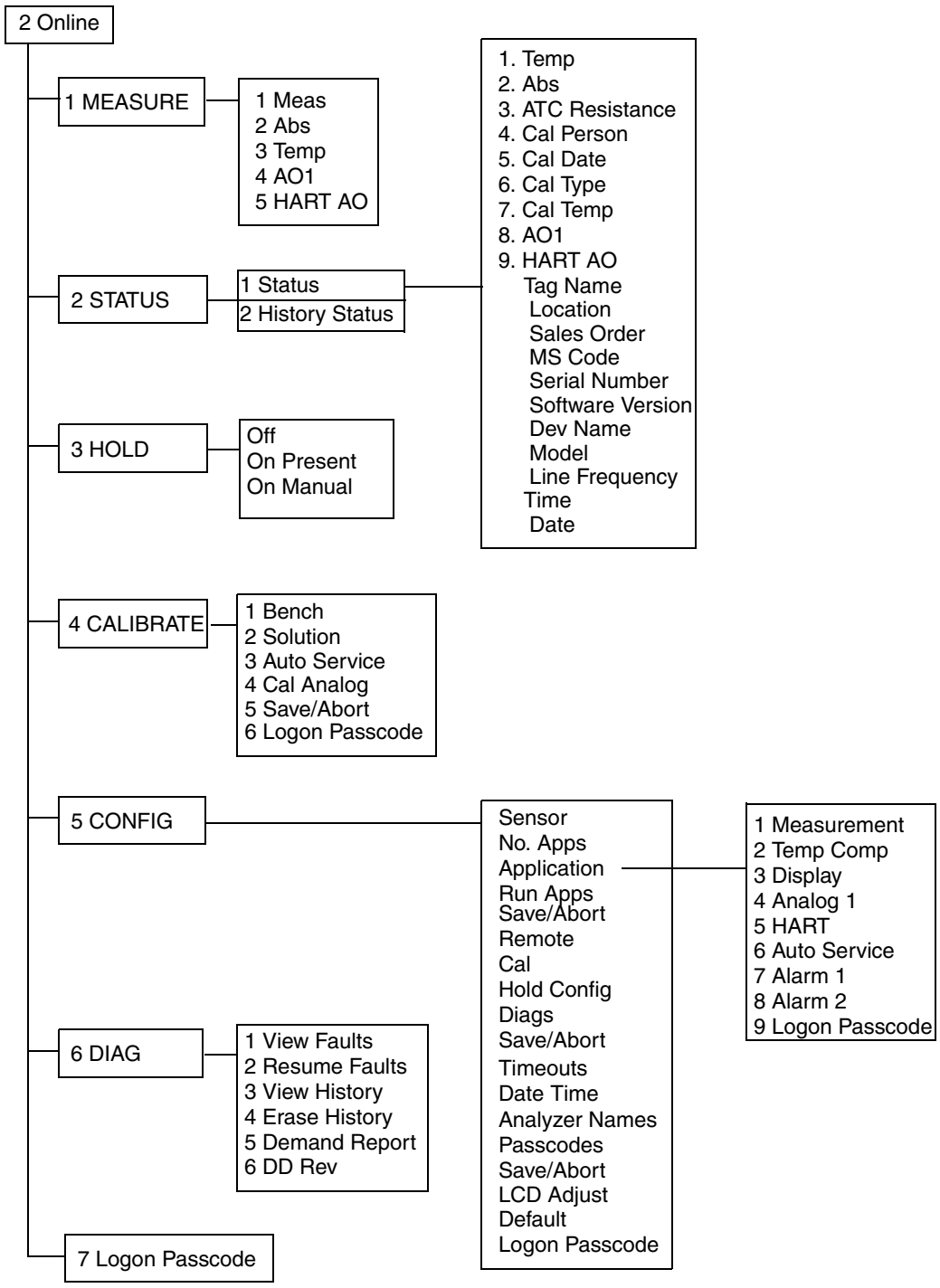


Figure 44. Online Configuration Flowchart

Online Modes

Measurement

To display the measurement on the communicator, select **1 Measure** from the Online menu. The display will show:

1 Meas	The measurement value in engineering units.
2 Abs	The uncompensated measurement in millivolts.
3 Temp	The temperature measurement in engineering units.
4 A01	Analog Output 1 (PV) in mA.
5 HART AO	HART Analog Output (SV) in mA.

You can then select what you wish to display.

Status

To display the status on the communicator, select **2 Status** from the Online menu. You can then select to view the Current Status or the History Status and view the status of a number of parameters.

Hold

To access the Hold functions from the communicator, select **3 Hold** from the Online menu. Access requires you to have previously entered the proper passcode. You can then select **Off** to not use the Hold function, **Present** to hold all values and states at their current value, and **Manual** to set values and states at desired levels. In **Manual**, the Hold function does not take effect until all the values are entered.

Calibrate

To access the Calibration functions from the communicator, select **4 Calibrate** from the Online menu. Access requires you to enter the proper passcode. You can then select **Bench**, **Solution**, or **Cal Analog** calibration. If you select **Cal Analog**, you must further define the output as **AO1** or **HART**.

— NOTE

If **Save/Abort** appears in the Calibration menu, there are configuration changes pending. **Save/Abort** must be selected before any calibration is allowed.

Configure

To access the Configuration functions from the communicator, select **5 Config** from the Online menu. Access requires you to enter the proper passcode. You can then configure a number of parameters from the menu that is presented.

— NOTE

Before leaving the Configure mode, you must activate **Save/Abort** if it is visible.

Diagnostics

To access the Diagnostic functions from the communicator, select **6 Diag** from the Online menu. You can then select **View Faults**, **Resume Faults**, **View History**, **Erase History**, **Demand Report**, or **DD Rev**. The proper passcode is required to suspend a fault or to erase the history log.

— NOTE

The DD Rev may not change with upgrade to subsequent firmware versions.

Logon Passcode

To access certain functions from the HART Communicator, you must enter the Level 1, Level 2, or Level 3 passcode (that was configured into the analyzer) into the HART Configurator. To do this, select **7 Logon Passcode** from the Online menu.

— NOTE

7 Logon Passcode can also be used to 'lock' the analyzer by entering an invalid passcode.

Glossary of Online Parameters

Parameter	Explanation
Measure Mode	
Abs	Displays the absolute (uncompensated) measurement
AO1 [a]	Displays the Analog Output 1 (PV) measurement in mA or volts
HART AO [a]	Displays the HART Analog Output (SV) measurement in mA
Meas	Displays the measurement in specified engineering units
Temp	Displays the process temperature measurement in specified engineering units
Status Mode [b]	
Abs	Displays the absolute measurement
AO1	Displays the value of Analog Output 1 (PV) in mA or volts
ATC Resistance	Displays the resistance of the temperature compensator
Cal Date	Displays the date of the last calibration in the form mm/dd/yy
Cal Person	Displays the name of the last calibrator
Cal Temp	Displays the temperature calibration type of last calibration (default, custom, solution, failsafe, manual)
Cal Type	Displays the type of the last calibration (bench, solution, factory default)
Date	Displays the current date
Dev Name	Displays the device name of the analyzer
HART AO	Displays the HART analog output (SV) in mA
History Status	Displays up to 10 of the most current history log entries (if present)
Line Frequency	Displays the ac line frequency of the analyzer
Location	Displays the location of the measurement
Model	Displays the model number of the analyzer
MS Code	Displays the analyzer model code
Sales Order	Displays the analyzer sales order number
Serial Number	Displays the analyzer serial number
Software Version	Displays the software version of the analyzer
Status	Displays the current status of the analyzer
Tag Name	Displays the tag name of the analyzer
Temp	Displays the process temperature of the sensor
Time	Displays the current time
Hold Mode	
Off	Used to release the analyzer from Hold state
On Manual	Used to hold all values and states at desired levels
On Present	Used to hold all values and states at their current level
Calibrate Mode [c]	

Parameter	Explanation
Auto Service n	Used to perform an automatic cleaning of the sensor and/or a 1-point or 2-point calibration as configured
Bench	Used to perform a calibration using theoretical inputs or to return to the stored factory default calibration
Cal Analog	Used to tune the 4 mA and 20 mA values of the AO1 or HART analog outputs
Logon Passcode	Used to enter the passcode to access Calibration mode
Solution	Used to perform a calibration using real solutions
Config Mode	
Alarms	Used to specify each alarm to represent measurement, temperature, absolute, or a fault and then subparameters associated with each
Analog 1	Used to specify the Analog 1 output (PV) to represent measurement, temperature, or absolute; minimum (LRV) and maximum (URV) range values; and failsafe output
Analyzer Names [(e)]	Used to specify the tag number, tag name, location, and device name
Application	Used to specify the measurement, display, temperature compensation, output, and alarm configuration for each application.
Auto Service [(d)]	Used to configure auto service related parameters
Cal	Used to specify the options to be used with a solution calibration
Datetime	Used to set the date and time for the real time clock
Default	Used to reset the configuration back to the factory default values
Diags	Used to specify what fault messages can appear on your display
Display	Used to configure the display as single, dual, or scan and then subparameters associated with each
HART	Used to specify the HART outputs (SV, TV, FV) to represent measurement, temperature, or absolute; minimum (LRV) and maximum (URV) range values; and failsafe output. Also used to specify the Polling Address and the Preambles value.
Hold Config	Used to configure all values and states to be held at their current level (On Present) or at a desired level (On Manual) when triggered by a digital signal or when going into Calibration or Configuration mode
LED Adjust	Used to adjust the brightness of the front panel display
Logon Passcode	Used to enter the passcode to access Configuration mode
Measurement	Used to configure units, damping, and other measurement parameters
No. Apps	Used to specify the number of applications you wish to preconfigure.
Passcodes	Used to establish or change the Level 1, 2, and 3 passcodes
Remote	Used to configure parameters associated with a remote personal computer or RS232 printer

Parameter	Explanation
Run Apps	Used to switch form one application to another
Sensor	Used to configure sensor related parameters
Temp Comp	Used to configure the temperature compensation for the chemical being measured
Timeouts	Used to specify the time for front panel, remote, and digital communication timeouts
Diag Mode	
DD Rev	Used to display the DD version
Demand Report	Used to send the history log out to the remote RS232 port
Erase History	Used to erase the history log (requires Level 1 passcode)
Logon Passcode	Used to enter the passcode to perform functions requiring a passcode
Logon Passcode Mode	
Resume Faults	Used to resume any suspended faults
View Faults	Used to view any faults and possibly suspend each fault
View History	Used to view the diagnostic history

(a) If configured **Off**, display reads **NaN.**

(b) At message “Ignore next 50 occurrences of status?”, reply “YES”.

(c) If a disconnect occurs during calibration, recycle power or attempt another calibration.

(d) Auto Service monthly must schedule days 16 at a time in two entries.

(e) Use upper case letters for Tag Number.

7. Maintenance

⚠ WARNING

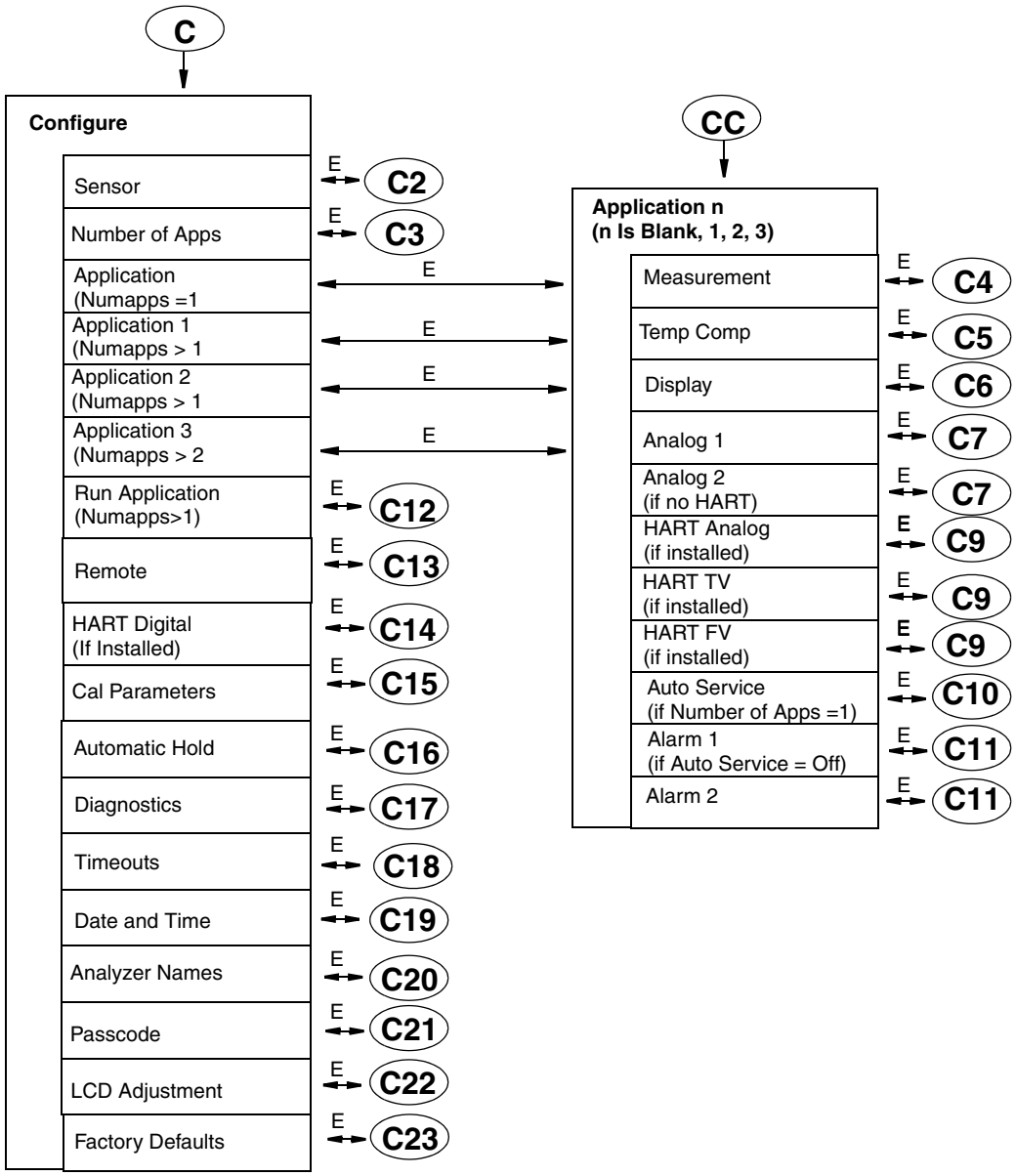
This product contains components that have critical safety characteristics. Do **not** substitute components. Replace components only with identical factory supplied components. Component substitution may impair the electrical safety of this equipment and its suitability for use in hazardous locations.

⚠ CAUTION

Your analyzer uses printed wiring assemblies with MOS devices that are highly susceptible to damage from electrostatic discharge. Relatively low static potential can rupture MOS devices resulting in shorted gate or degraded device characteristics. It is recommended that assemblies with MOS devices be handled with the user earthed (grounded) by wearing a conductive wrist strap or by standing on an ESD mat.

The maintenance of the 875EC Analyzer is limited to the replacement of the display assembly and printed wiring assemblies. See PL 611-158 (Style A and B) or PL 611-163 (Style C) for part numbers. Attempts by the user to repair printed wiring assemblies could result in damage and voiding of the warranty. The recommended repair procedure is replacement of the PWAs or return of the PWAs to the factory for repair.

Appendix A. Structure Diagrams



NOTE: Before entering Configuration mode, you must first enter a proper passcode. The factory default passcode is **0800**. Then you must pick **View** (to view configuration parameters) or **Change** (to change configuration parameters) from the picklist presented.

Figure A-1. Configuration Top Level Structure Diagram

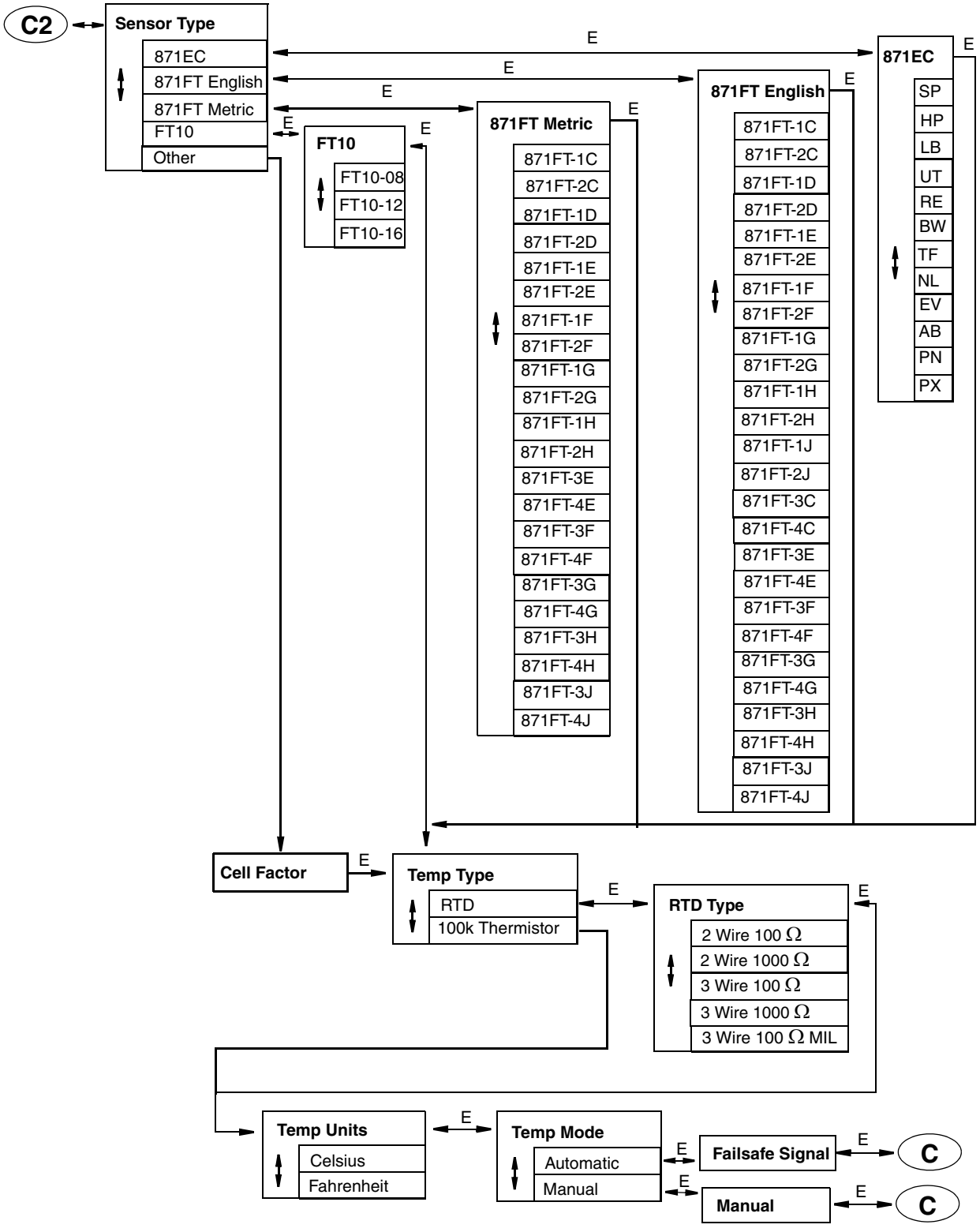


Figure A-2. Configure Sensor Structure Diagram

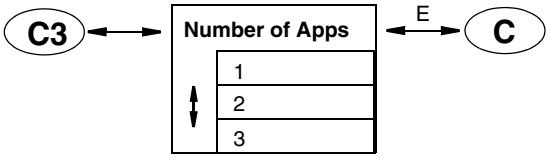


Figure A-3. Configure Applications Structure Diagram

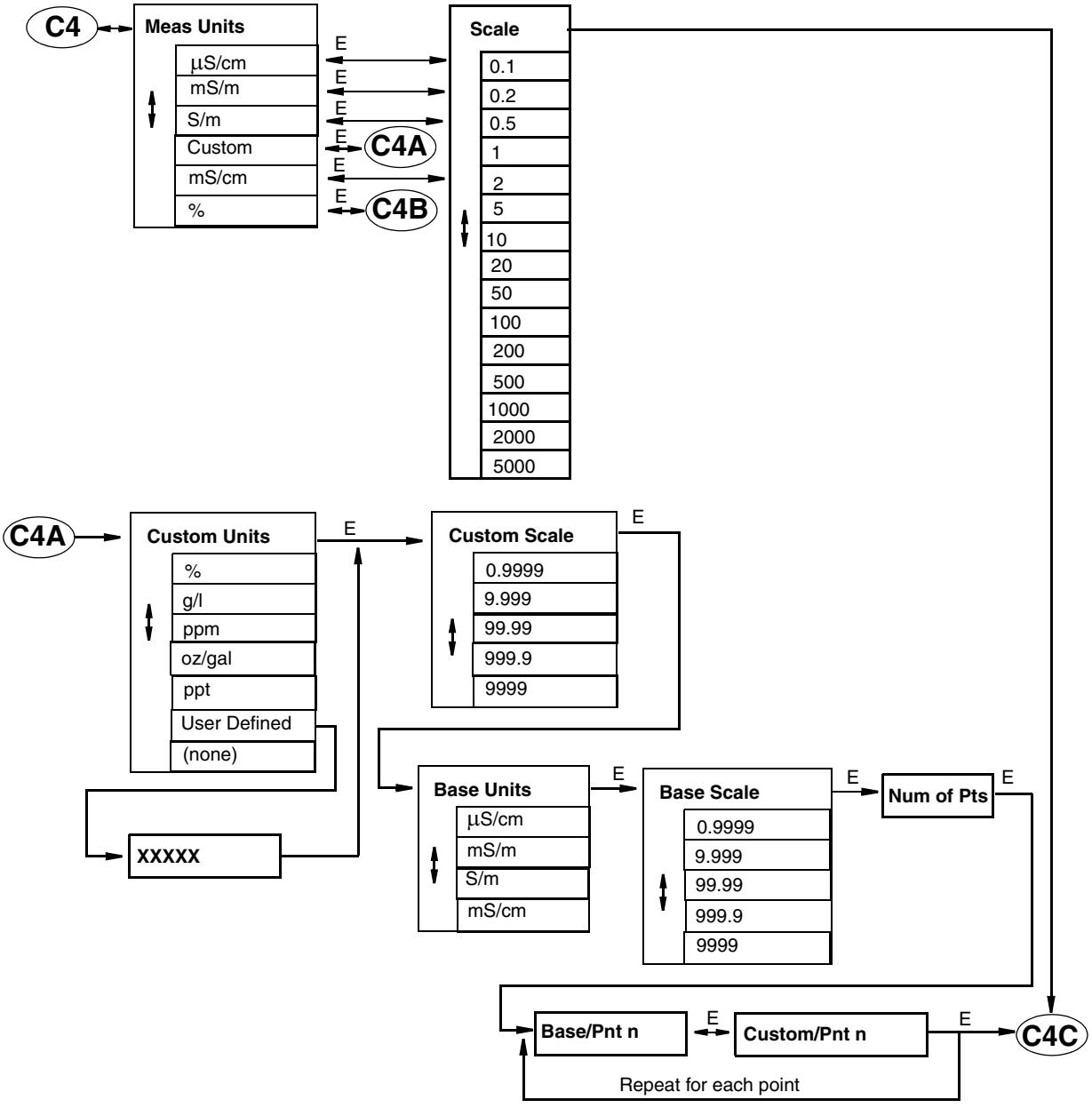


Figure A-4. Configure Measurement Structure Diagram

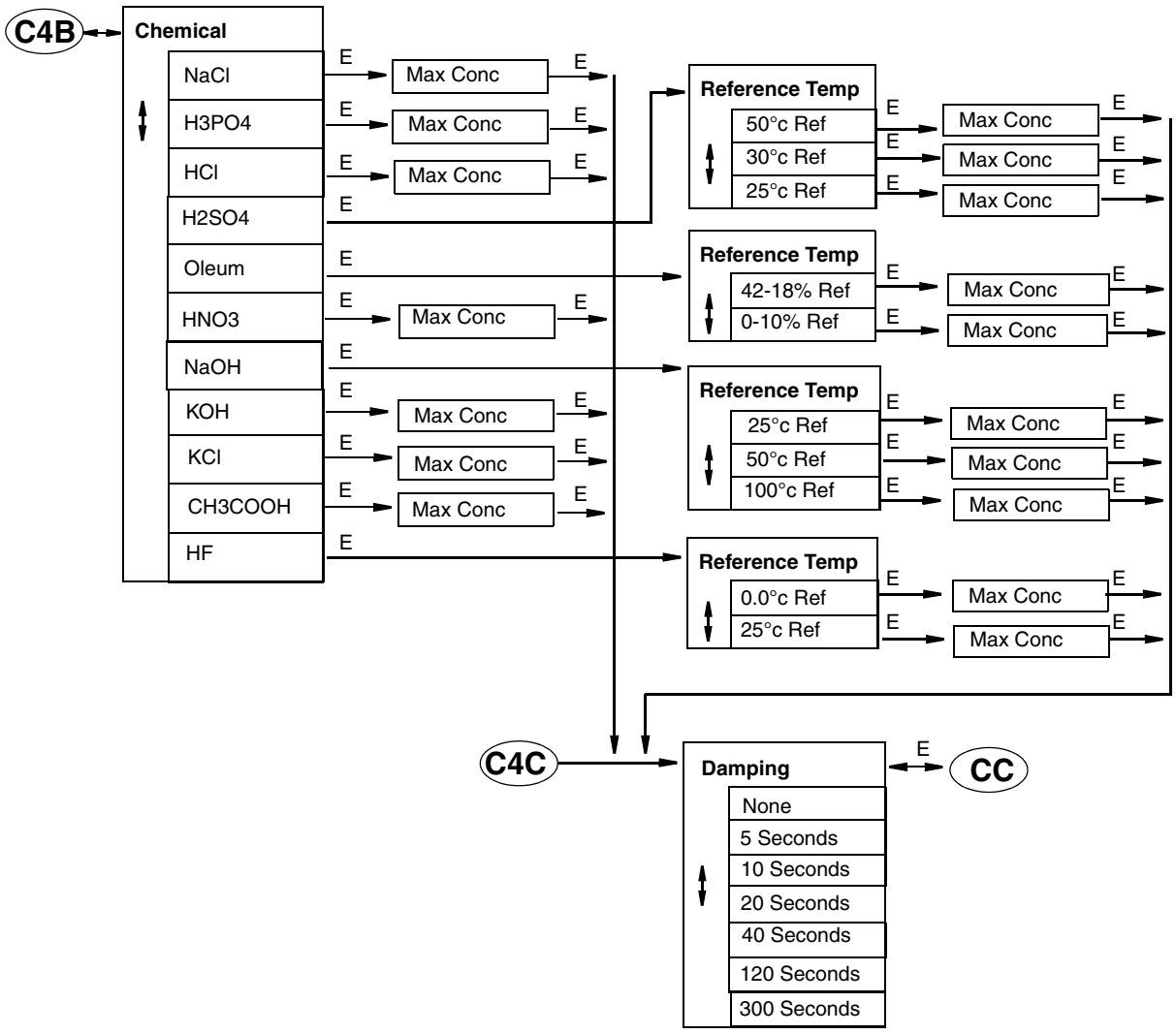


Figure A-5. Configure Measurement Structure Diagram

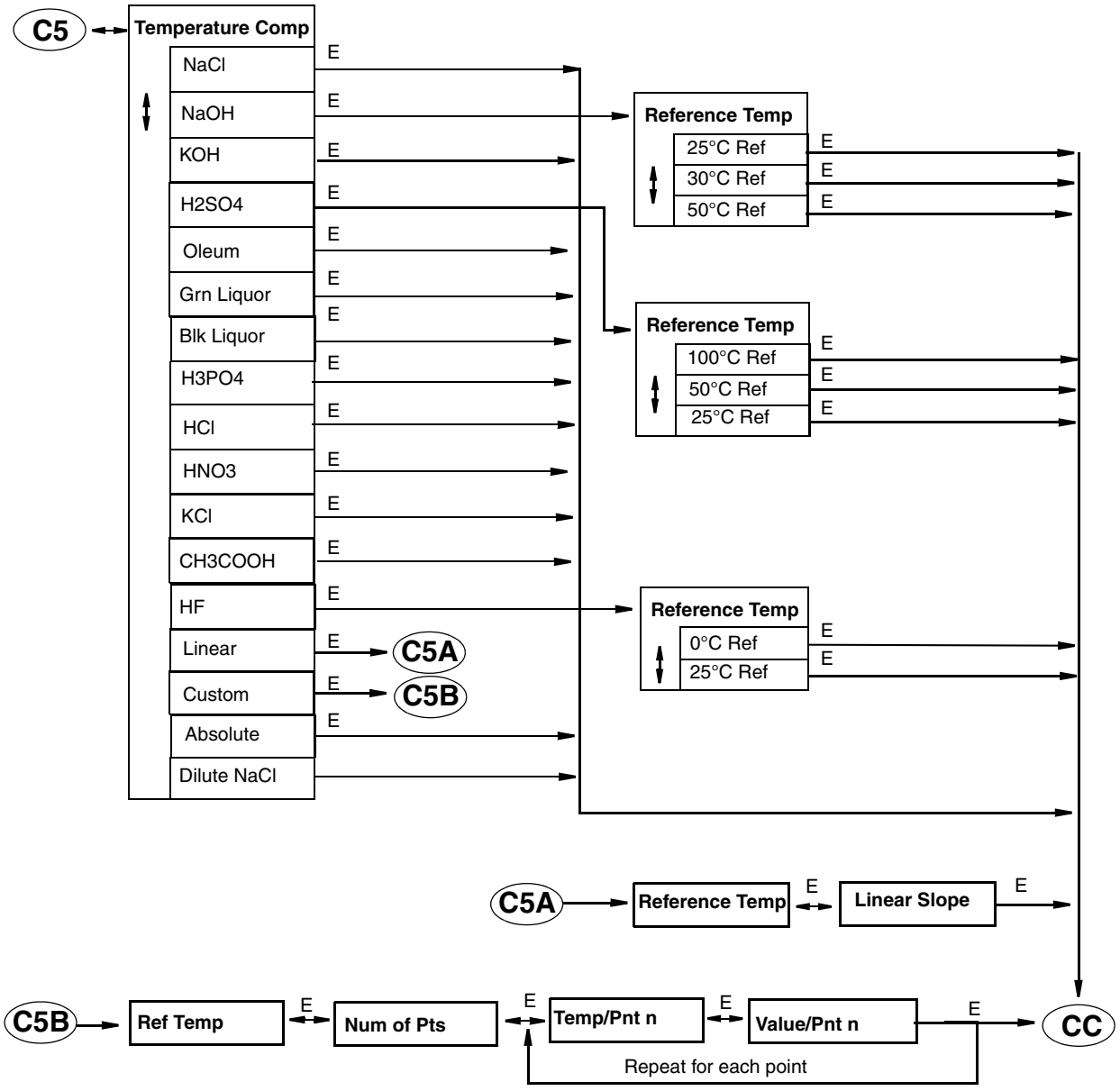
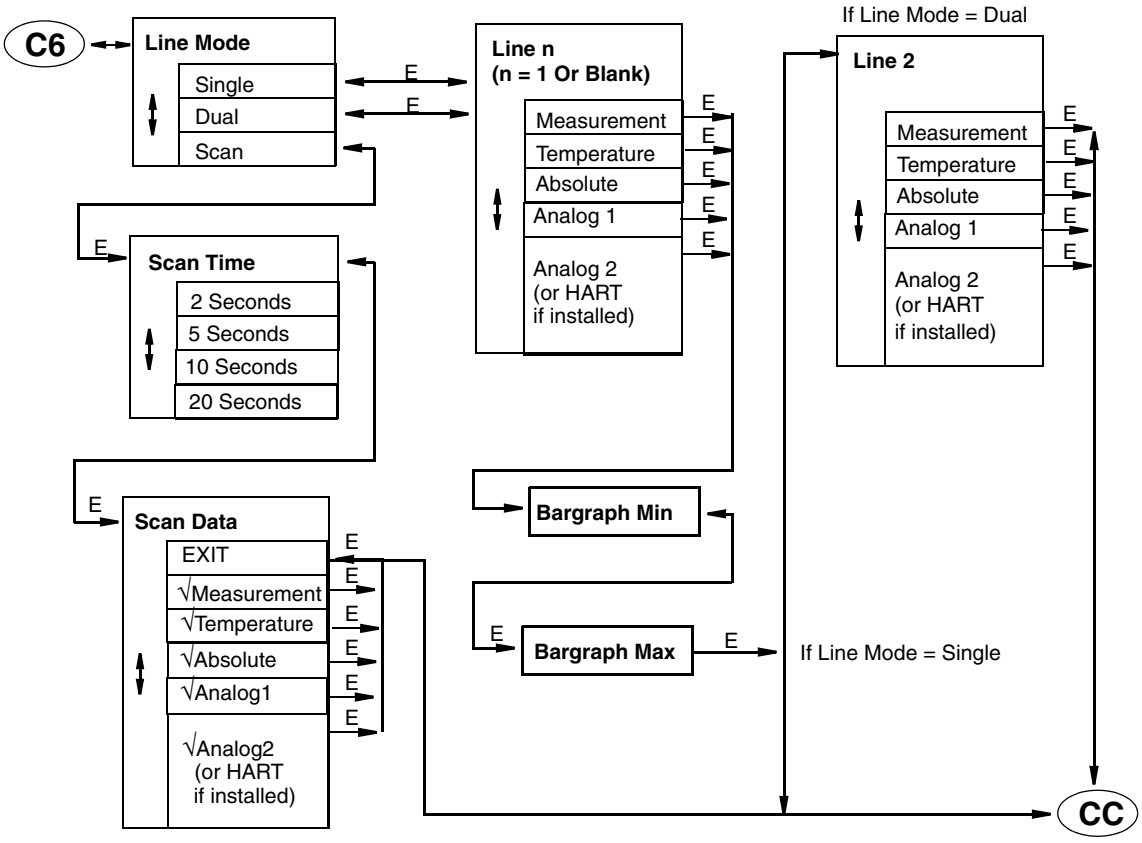


Figure A-6. Configure Tempcomp Structure Diagram



Choices selected have preceding "√".
Pressing **Enter** toggles choice as selected or not selected.

Figure A-7. Configure Display Structure Diagram

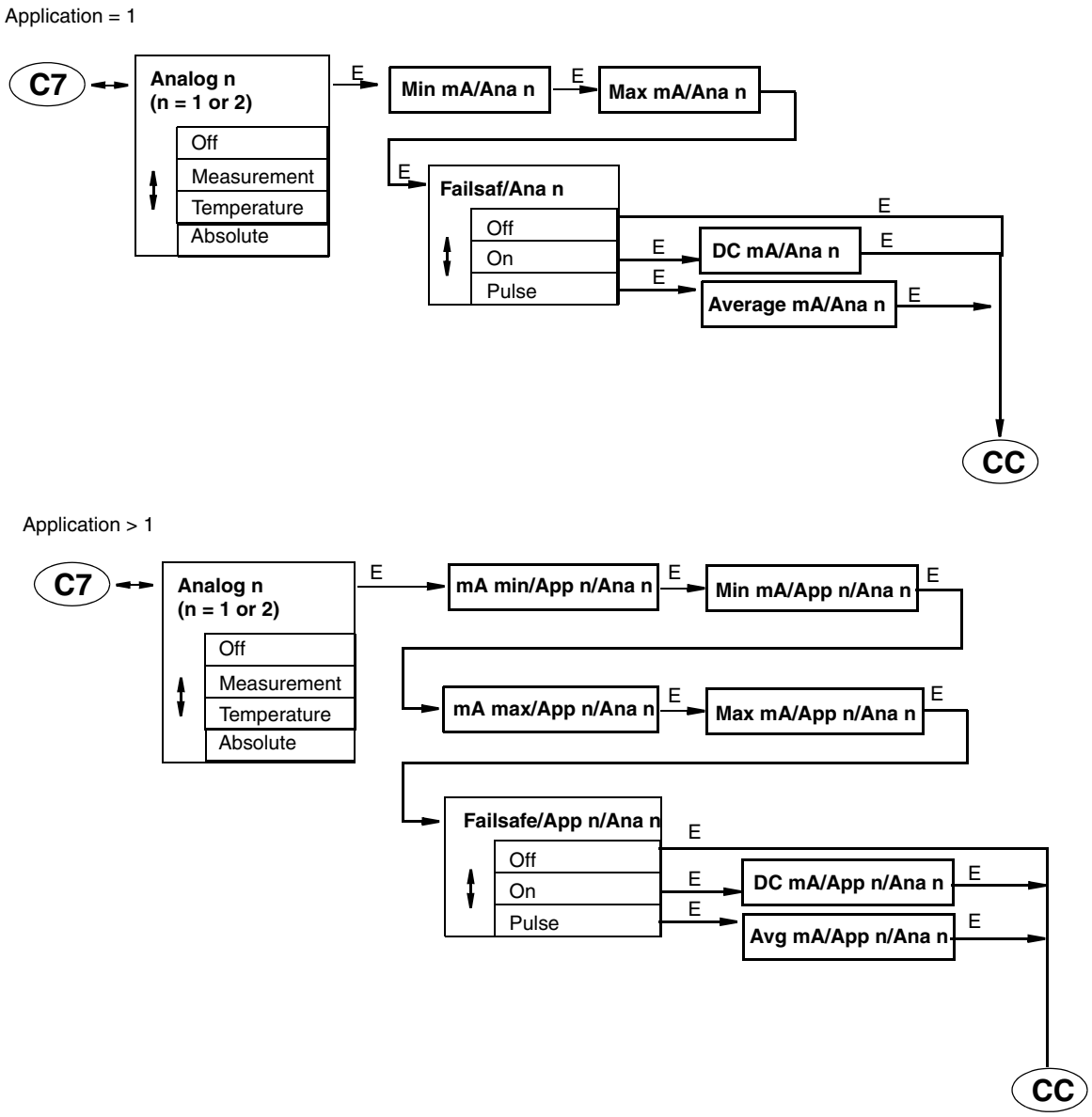


Figure A-8. Configure Analog Structure Diagram

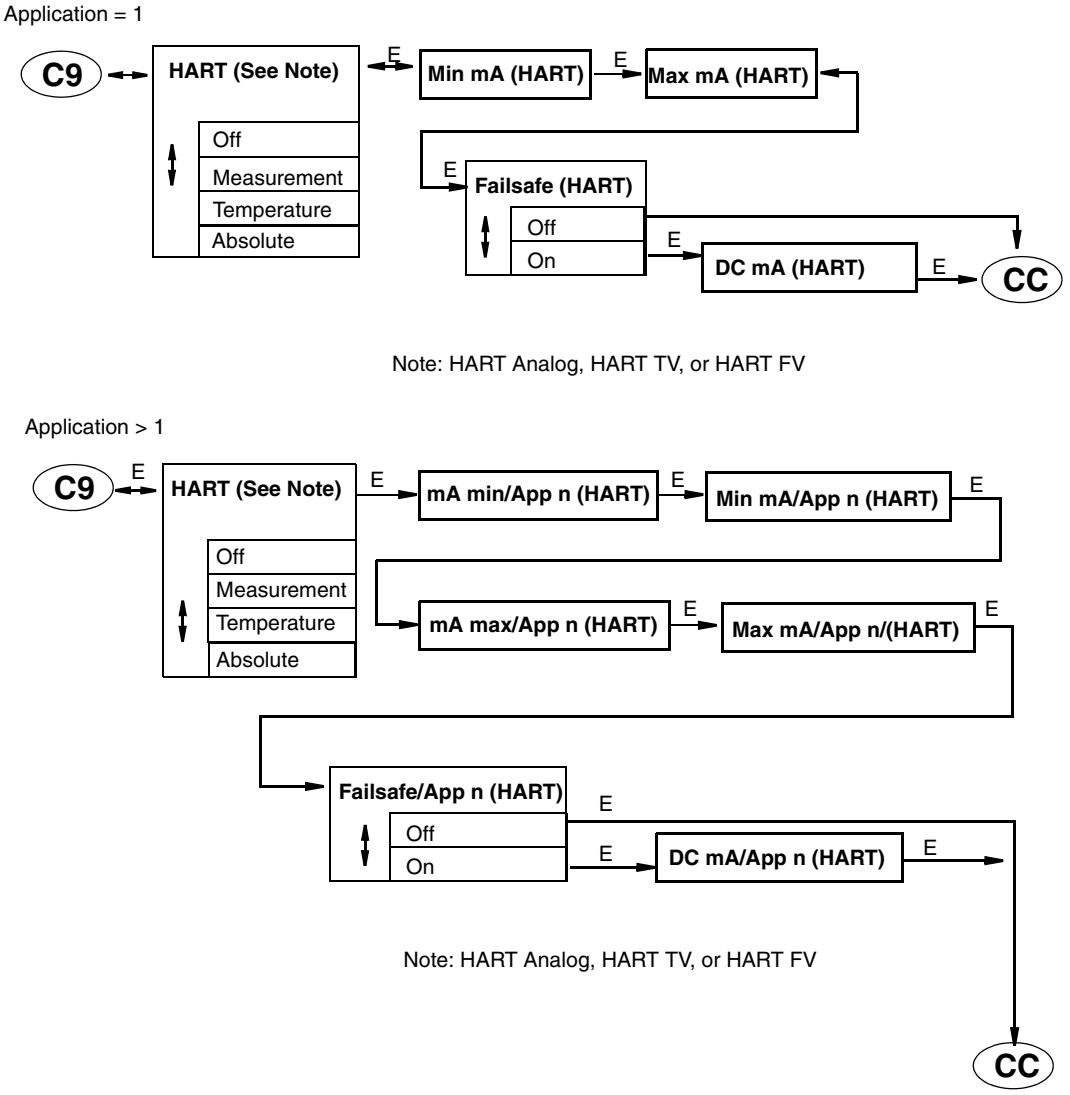


Figure A-9. Configure HART Analog, HART TV, and HART FV Structure Diagram

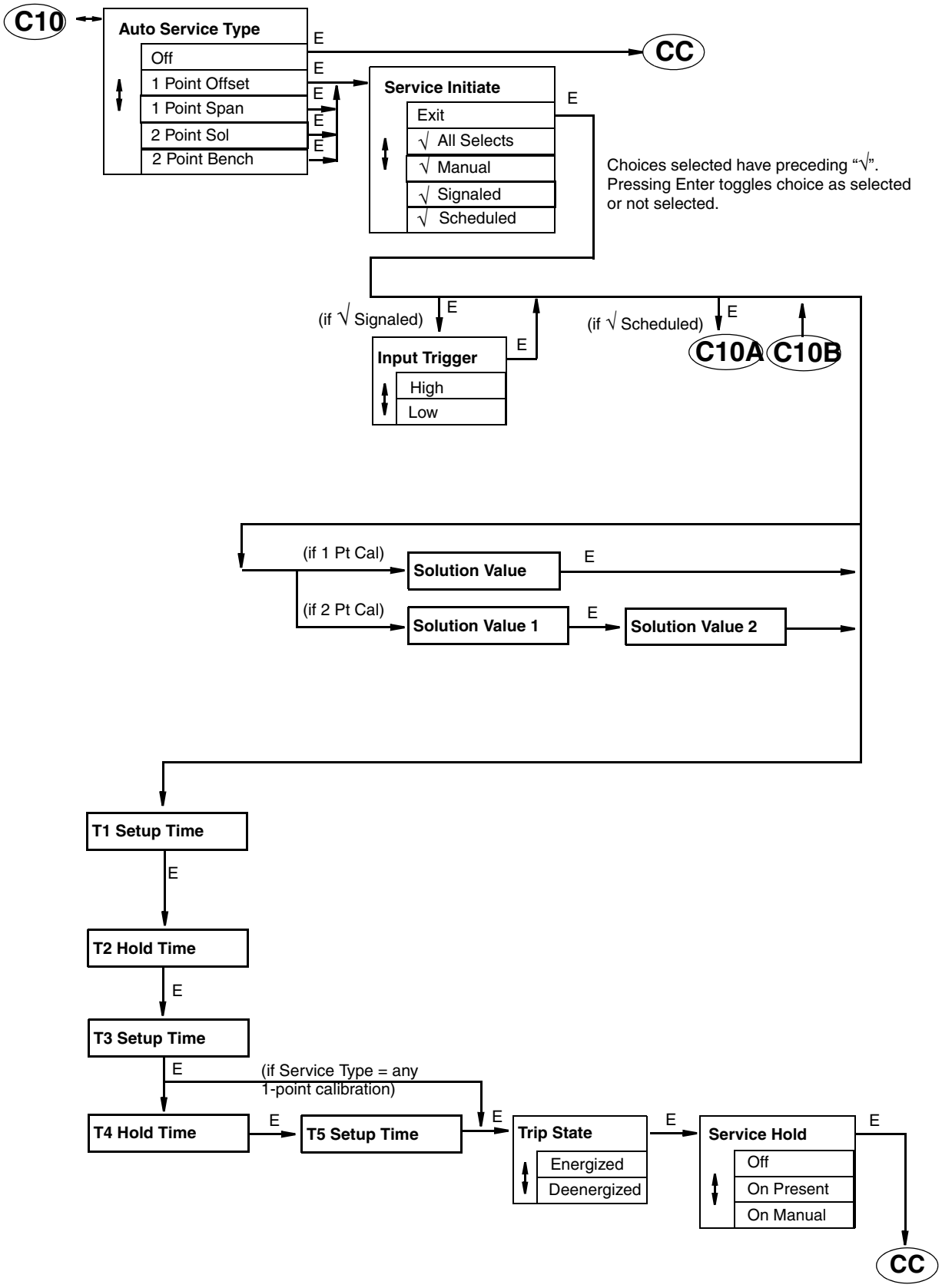


Figure A-10. Configure Auto Service Structure

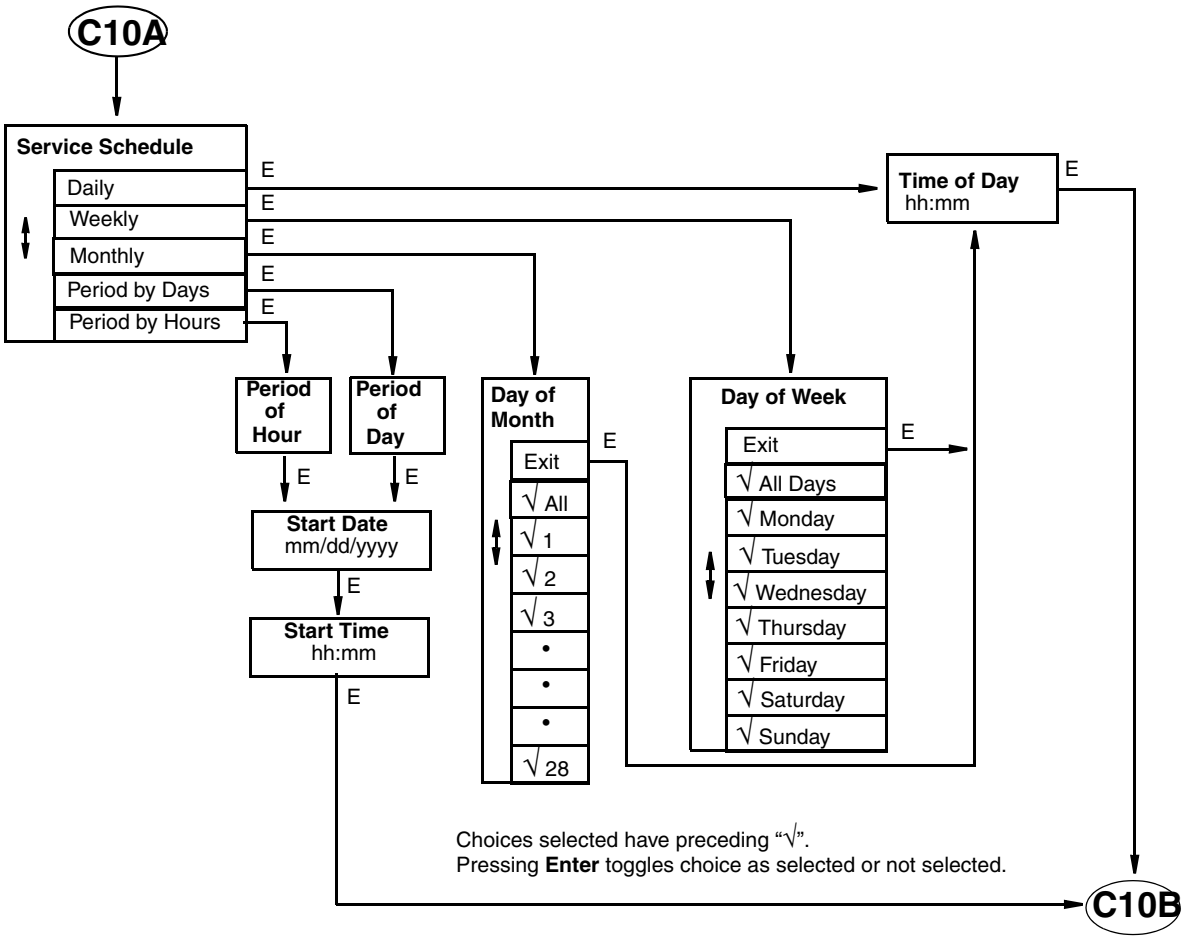


Figure A-11. Configure Auto Service Structure (Continued)

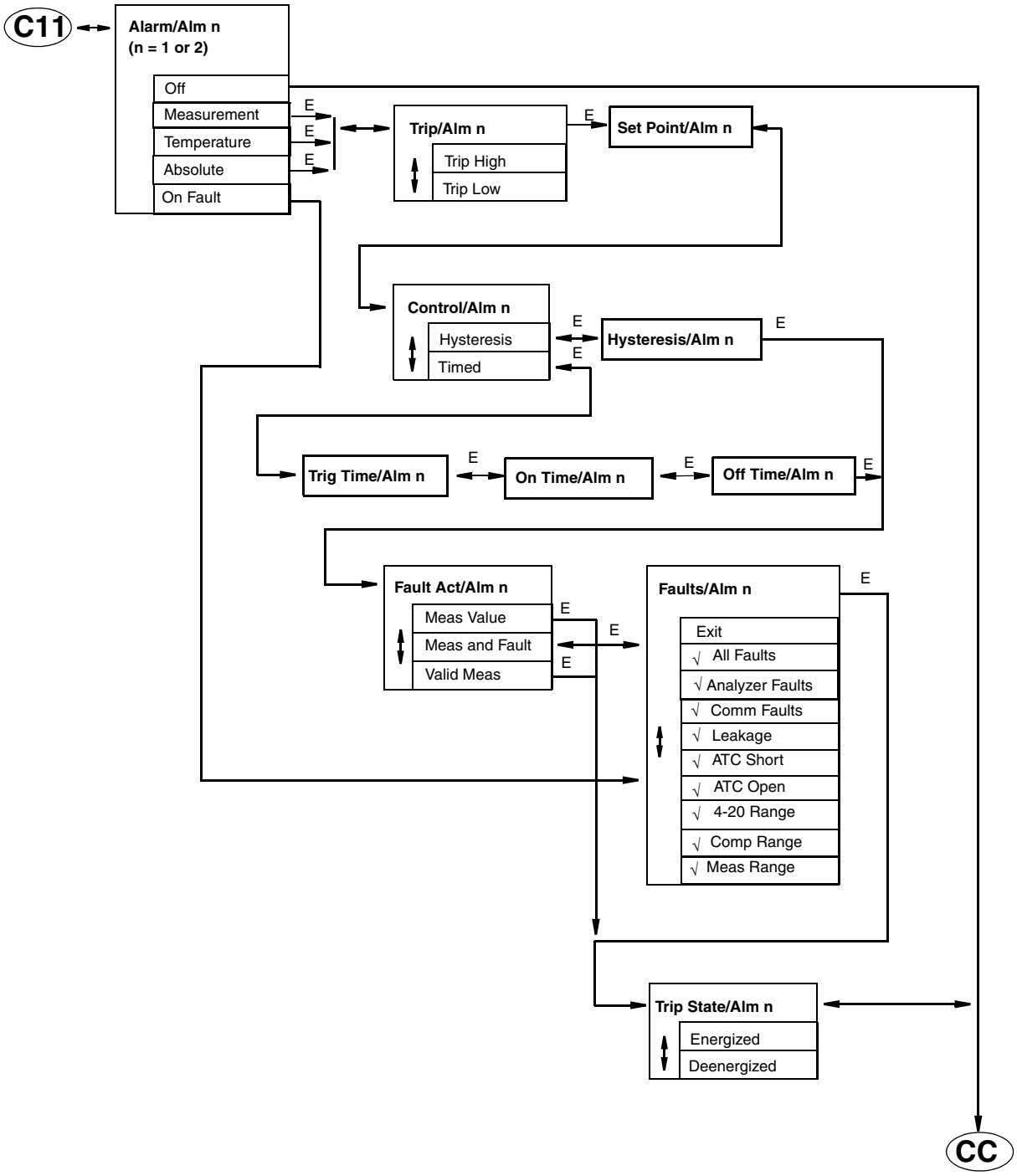


Figure A-12. Configure Alarm Structure Diagram

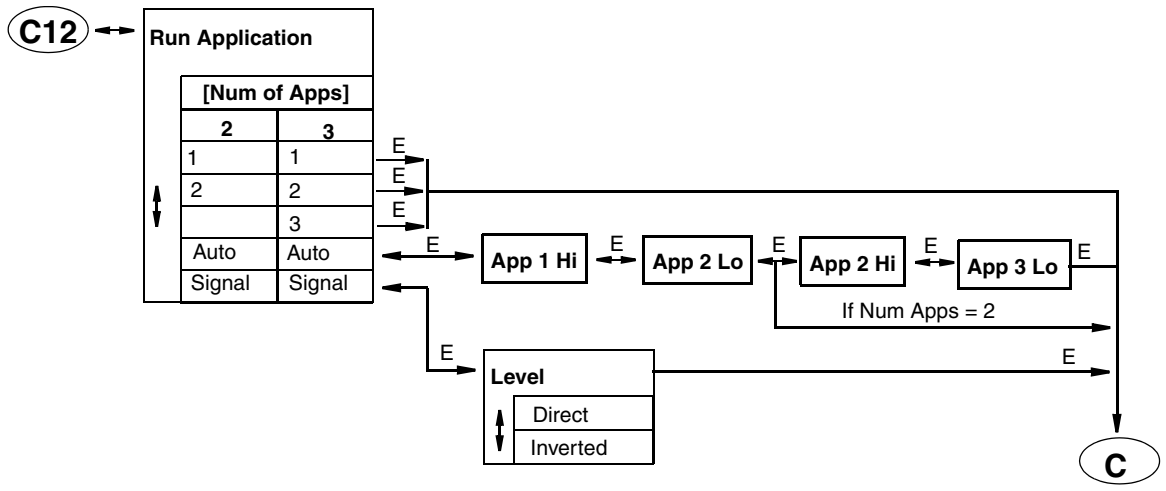


Figure A-13. Configure Run Application Structure Diagram

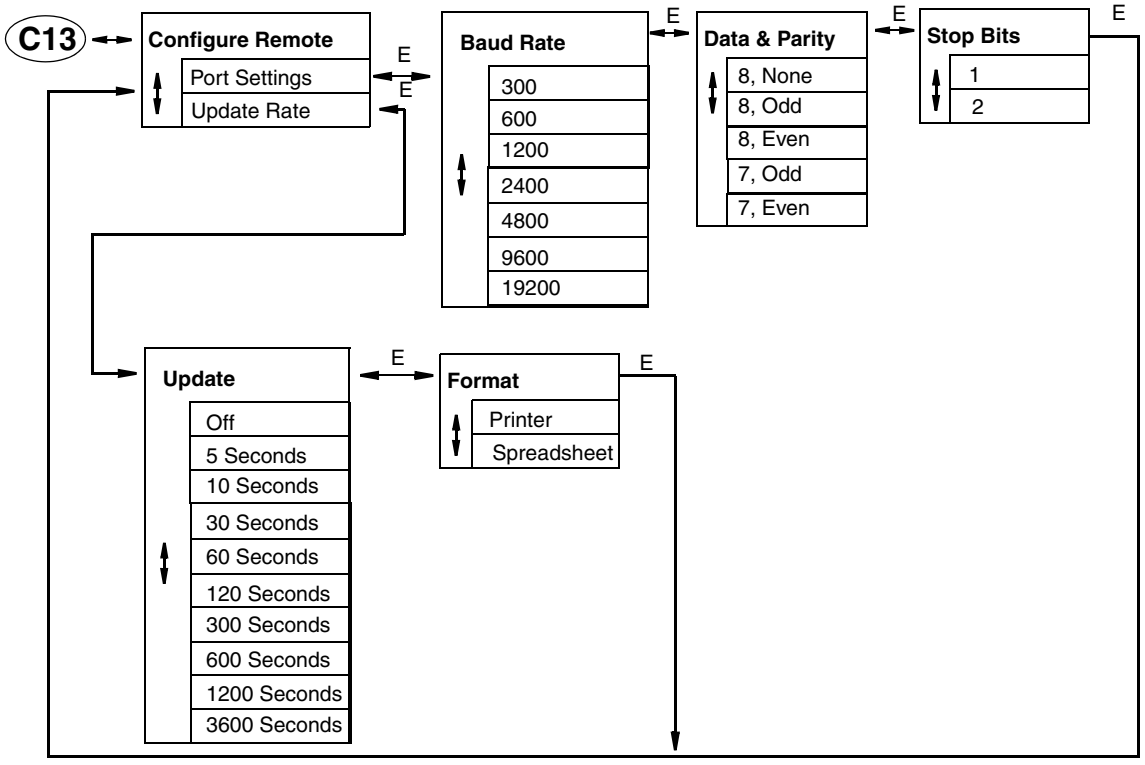


Figure A-14. Configure Remote Structure Diagram



Figure A-15. Configure HART Digital Structure Diagram

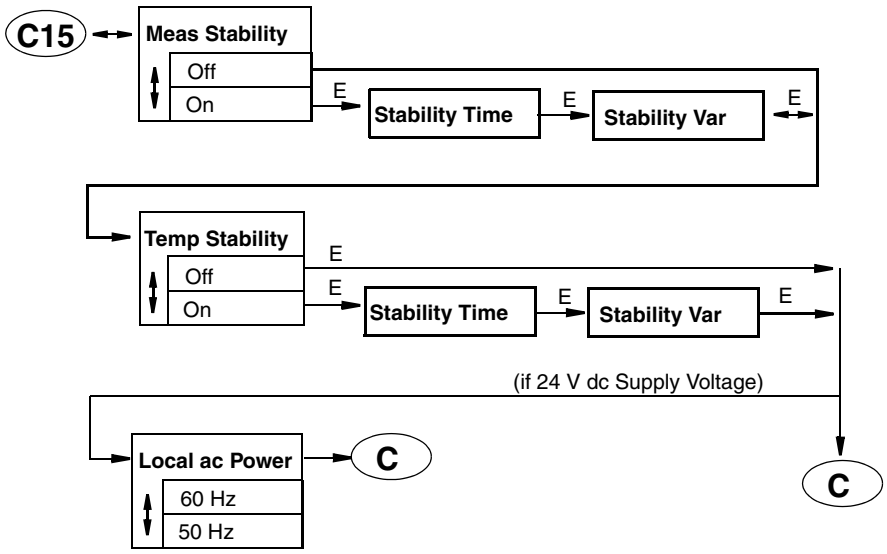


Figure A-16. Configure Calibration Parameters Structure Diagram

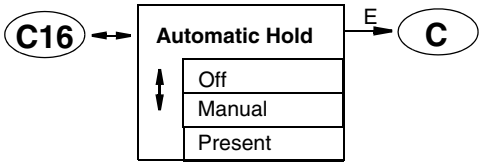


Figure A-17. Configure Automatic Hold Structure Diagram

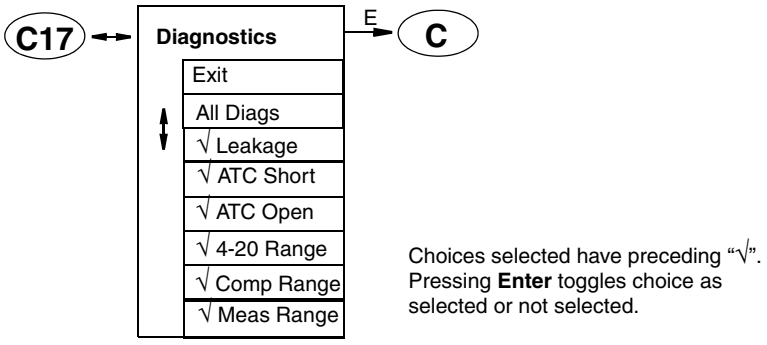


Figure A-18. Configure Diagnostics Structure Diagram

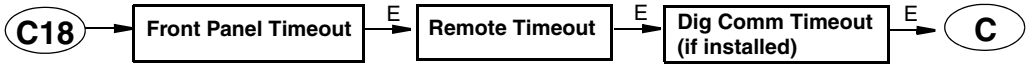


Figure A-19. Configure Timeouts Structure Diagram

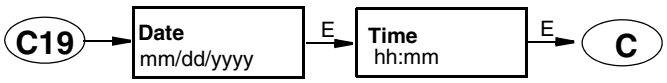


Figure A-20. Configure Date and Time Structure Diagram

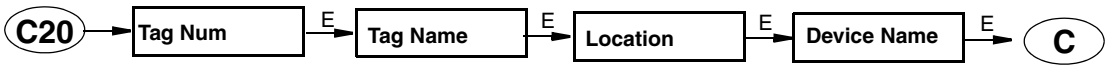


Figure A-21. Configure Analyzer Names Structure Diagram

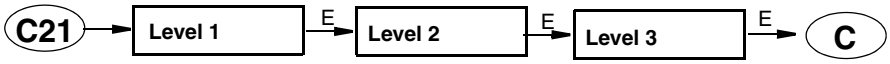


Figure A-22. Configure Passcode Structure Diagram

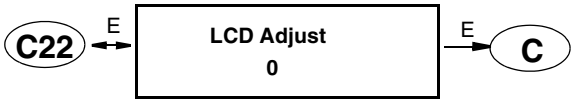


Figure A-23. Configure LCD Adjust Structure Diagram

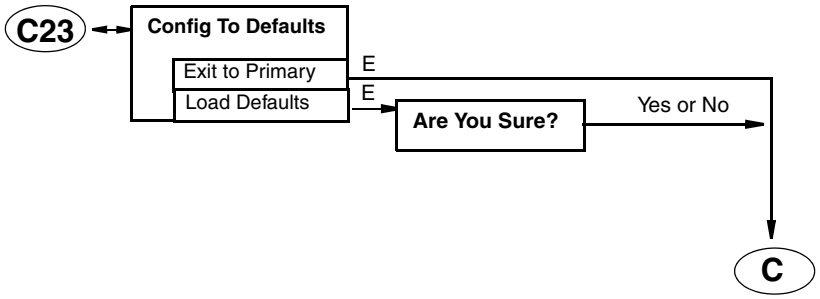


Figure A-24. Configure Factory Defaults Structure Diagram

Appendix B. Configuration Table

This appendix contains information that helps you configure your analyzer. The information is presented in the form of a table containing each prompt/parameter, its limits, and its factory default value. It also provides space for you to record your specific configuration and notations.

NOTE

Bold print in the Factory Configuration column indicates the configuration resulting from the Configure Factory Defaults menu.

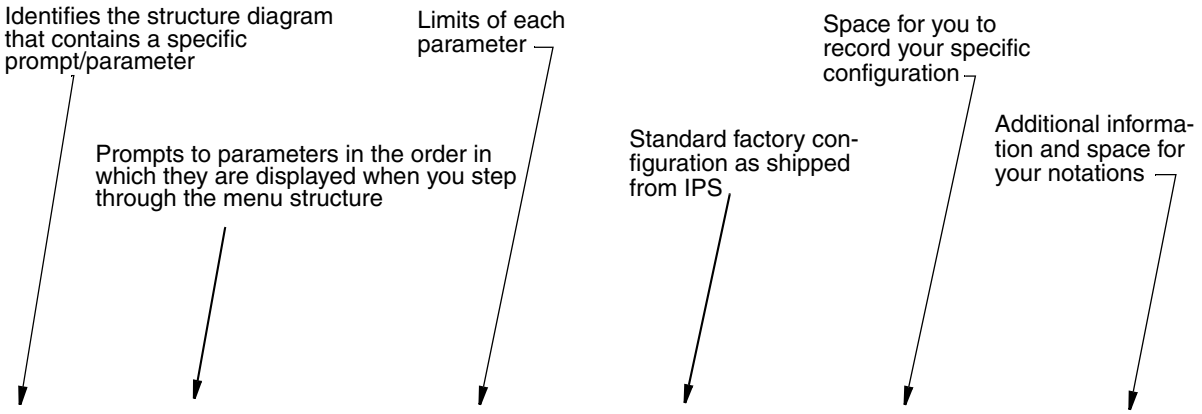


Figure	Prompt/Parameter	Parameter Limits	Factory Configuration	User Configuration	Remarks and Notes
A-1	Config	Sensor Number of Apps Application Application 1 Application 2 Application 3 Run Application Remote HART Digital (if HART installed) Cal Parameters Automatic Hold Diagnostics Timeouts Date and Time Analyzer Names Passcode LCD Adjustment Factory Default	Sensor		

Figure	Prompt/Parameter	Parameter Limits	Factory Configuration	User Configuration	Remarks and Notes
A-2	Sensor Type	871EC, 871FT English, 871FT Metric, FT10, Other	**871EC**		
	871EC	SP, HP, LB, UT, RE, BW, TF, NL, EV, AB, PN, PX	**SP**		
	871FT English	871FT-1C, 2C, 1D, 2D, 1E, 2E, 1F, 2F, 1G, 2G, 1H, 2H, 1J, 2J, 3C, 4C, 3E, 4E, 3F, 4F, 3G, 4G, 3H, 4H, 3J, 4J	871FT-1C		
	871FT Metric	871FT-1C, 2C, 1D, 2D, 1E, 2E, 1F, 2F, 1G, 2G, 1H, 2H, 3E, 4E, 3F, 4F, 3G, 4G, 3H, 4H, 3J, 4J	871FT-1C		
	FT10	FT10-08, FT10-12, FT10-16	FT10-08		
	Other	- - -	- - -		
	Cell Factor	0.0001 to 99.999 by 0.0001	0.0001		If Sensor Type = Other
	Temp Type	RTD, 100K Thermistor	**100K Thermistor**		
	RTD Type	2 Wire 100 Ω, 2 Wire 1000 Ω, 3 Wire 100 Ω, 3 Wire 100 Ω, MIL 3 Wire 1000 Ω	2 Wire 100 Ω		If Temp Type = RTD
	Temp Units	Celsius, Fahrenheit	**Fahrenheit**		
	Temp Mode	Automatic, Manual	**Automatic**		
	Failsafe Signal	-20 to +200 by 0.1°C -4 to +392 by 0.1°F	**77°F**		If Temp Mode = Automatic
	Manual	-20 to +200 by 0.1°C -4 to +392 by 0.1°F	0.0		If Temp Mode = Manual
A-3	Number of Apps	1, 2, 3	**1**		

Figure	Prompt/Parameter	Parameter Limits	Factory Configuration	User Configuration	Remarks and Notes
A-4	Meas Units	µS/cm, mS/m, S/m, Custom, mS/cm, %	**mS/cm**		
	Scale	Depends on sensor	**50**		If Meas Units not % or Custom
	Custom Units	%, g/l, ppm, oz/gal, ppt, None, User Defined	%		If Meas Units = Custom
	Custom Scale	0.9999, 9.999, 99.99, 999.9, 9999	9999		
	Base Units	µS/cm, mS/m, S/m, mS/cm	µS/cm		
	Base Scale	0.9999, 9.999, 99.99, 999.9, 9999	9999		
	Num of Pts	2 to 21	2		
	Base/Pnt n	0 to 2000	0		
	Custom/Pnt n	0 to 2000	0		
A-5	Chemical	NaCl, H3PO4, HCl, H2SO4, Oleum, HNO3, NaOH, KOH, KCl, CH3COOH, HF	NaCl		
	Damping	None, 5, 10, 20, 40, 120, 300 Seconds	**None**		
A-6	Temperature Comp	Dilute NaCl, NaCl, NaOH, KOH, H2SO4, Oleum, Grn Liquor, Blk Liquor, H3PO4, HCl, HNO3, KCl, CH3COOH, HF, Linear, Custom, Absolute	**NaCl**		
	Linear Slope	0.5 to 5.0 %/°C	0.5		If Temperature Comp = Linear
	Ref Temp	-20 to +200 by 0.1°C -4 to +392 by 0.1°F	0.0		If Temperature Comp = Custom
	Num of Pts	2 to 21	2		
	Temp/Pnt n	-20 to +200 by 0.1°C -4 to +392 by 0.1°F	0.0		
	Value/Pnt n	0.001 to 9.999	1.0		

Figure	Prompt/Parameter	Parameter Limits	Factory Configuration	User Configuration	Remarks and Notes
A-7	Line Mode	Single, Dual, Scan	**Dual**		
	Scan Time	2, 5, 10, 20 Seconds	2		
	Scan Data	Exit, Measurement, Temperature, Absolute, Analog 1, Analog 2 (or HART)	Measurement		
	Line, Line 1, Line 2	Measurement, Temperature, Absolute, Analog 1, Analog 2 (or HART)	**Line 1 = Measurement, Line 2 = Temperature**		Line if Line Mode = Single, Line 1 or Line 2 if Line Mode = Dual
	Bargraph Min	See Scale	**0**		If Line or Line 1 = Meas, Temp, or Abs
	Bargraph Max	See Scale	**50**		
A-8	Analog n	Off, Measurement, Temperature, Absolute	**Analog 1 = Measurement, Analog 2 = Measurement**		
	Min mA/Ana n	See Scale	**0**		If Analog n ≠ Off
	Max mA/Ana n	See Scale	**10**		If Analog n ≠ Off
	Failsaf/Ana n	Off, On, Pulse	**Off**		
	DC mA/Ana n	3.8 to 20.5	20.5		If Failsafe = On
	Average mA/Ana n	3.8 to 20.5	10		If Failsafe = Pulse
A-9	HART Analog	Off, Measurement, Temperature, Absolute	Measurement		
	Min mA (HART)	See Scale	0.0		
	Max mA (HART)	See Scale	Full Scale		
	Failsafe (HART)	Off, On	Off		
	DC mA (HART)	3.8 to 20.5	20.50		If Failsafe = On
A-9	HART TV	Same as for HART Analog	Off		If HART installed
A-9	HART FV	Same as for HART Analog	Off		If HART installed

Figure	Prompt/Parameter	Parameter Limits	Factory Configuration	User Configuration	Remarks and Notes
A-10	Auto Service Type	Off, 1 Point Offset, 1 Point Span, 2 Point Sol, 2 Point Bench	**Off**		
	Service Initiate	Exit, All Selects, Manual, Signaled, Scheduled	All disabled		If Auto Service Type ≠ Off
	Input Trigger	High, Low	High		If Service Initiate = Signaled
	Scheduled	Daily, Weekly, Monthly, Period by Days, Period by Hours	Daily		If Service Initiate = Scheduled
	Hours	1 to 8760	1		If Scheduled = Period by Hours
	Period of Day	1 to 365	1		If Scheduled = Period by Days
	Start Date	1/01/1999 to 12/31/2098	1/01/2000		If Scheduled = Period by Days or Period by Hours
	Start Time	00:00 to 23:59	00:00		
	Day of Month	All Days and 1 through 28	1		If Scheduled = Monthly
	Day of Week	All Days and Monday through Sunday	All disabled		If Scheduled = Weekly
	Time of Day	00:00 to 23:59	00:00		
	Solution Value, Solution Value n	0 to Full Scale	0.00		
	T1 Setup Time	15-999	15		
	T2 Hold Time	15-999	15		If any 1 Point Cal
	T3 Setup Time	15-999	15		
	T4 Hold Time	15-999	15		If any 2 Point Cal
	T5 Setup Time	15-999	15		
	Trip State	Energized, Deenergized	Energized		
	Hold	Off, On Present, On Manual	Off		

Figure	Prompt/Parameter	Parameter Limits	Factory Configuration	User Configuration	Remarks and Notes
A-12	Alarm n	Off, Measurement, Temperature, Absolute, On Fault	**Alarm 1 = Off, Alarm 2 = Off**		
	Trip/Alm n	Trip High, Trip Low	Trip High		
	Set Point/Alm n	See Scale	Full Scale		
	Control/Alm n	Hysteresis, Timed	Hysteresis		
	Hysteresis/Alm n	See Scale	0.3		If Control = Hysteresis
	Trig Time	00.00 to 99.99	1.0		If Control = Timed Time in minutes
	On Time	00.00 to 99.99	1.0		
	Off Time	00.00 to 99.99	1.0		
	Alm Fault Act n	Meas Value, Meas and Fault, Valid Meas	Meas Value		Accessible by Level 1 Passcode only.
	Faults/Alm n	Exit, All Faults, Analyzer Faults, Comm Faults, Leakage, ATC Short, ATC Open, 4-20 Range, Comp Range, Meas Range	All Faults		
	Trip State/Alm n	Energized, De-energized	De-energized		
A-13	Run Application	1, 2, Auto, Signal 1, 2, 3, Auto, Signal	1		If Num Apps = 2 If Num Apps = 3
	App 1 Hi	See Scale	Full Scale		
	App 2 Lo	See Scale	Full Scale		
	App2 Hi	See Scale	Full Scale		If Num Apps = 3
	App 3 Lo	See Scale	Full Scale		If Num Apps = 3
	Level	Direct, Inverted	Direct		If Run Application = Signal

Figure	Prompt/Parameter	Parameter Limits	Factory Configuration	User Configuration	Remarks and Notes
A-14	Configure Remote	Port Settings, Update Rate	Port Settings		
	Baud Rate	300, 600, 1200, 2400, 4800, 9600, 19200	**19200**		If Configure Remote = Port Settings
	Data Parity	8 None, 8 Odd, 8 Even, 7 Odd, 7 Even	**8, None**		
	Stop Bits	1, 2	**1**		
	Update	Off, 5, 10, 30, 60, 120, 300, 600, 1200, 3600 (seconds)	**600**		If Configure Remote = Update Rate
	Format	Printer, Spreadsheet			
A-15	HART Digital	- - -	- - -		If HART installed
	Poll Address	0 to 15	0		
	Preambles	5 to 255 by 1	5		
A-16	Cal Parameters	- - -	- - -		
	Meas Stability	Off, On	**Off**		
	Stability Time	5 to 60 by 5	5		If Meas Stability = On
	Stability Var	1 to 9 by 1	9		
	Temp Stability	Off, On	**Off**		
	Stability Time	5 to 60 by 5	5		If Temp Stability = On
	Stability Var	1 to 9 by 1	9		
	Local ac Power	50 or 60 Hz	**60 Hz**		For 24V dc power supply units only
A-17	Automatic Hold	Off, Manual, Present	**Manual**		
A-18	Diagnostics	Exit, All Diags, Leakage, ATC Short, ATC Open, 4-20 Range, Comp Range, Meas Range	**All Diags disabled**		
	All Diags	Enabled, Disabled	Disabled		
	Leakage	Enabled, Disabled	Disabled		
	ATC Short	Enabled, Disabled	Disabled		
	ATC Open	Enabled, Disabled	Disabled		
	4-20 Range	Enabled, Disabled	Disabled		
	Comp Range	Enabled, Disabled	Disabled		
	Meas Range	Enabled, Disabled	Disabled		

Figure	Prompt/Parameter	Parameter Limits	Factory Configuration	User Configuration	Remarks and Notes
A-19	Timeouts	- - -	- - -		
	Front Panel Timeout	0 to 999	**600**		
	Remote Timeout	5 to 999	**600**		
	Dig Comm Timeout	5 to 999	600		If Dig Comm installed
A-20	Date and Time	- - -	- - -		
	Date	Month: 1 to 12 Day: 1 to 31 Year: 1999 to 2098	**Real Date**		
	Time	Hour: 1 to 23 Minute: 00 to 59	**Real Time**		24 hour format
A-21	Analyzer Names	- - -	- - -		
	Tag Num	12 characters	(blank)		
	Tag Name	16 characters	(blank)		
	Location	14 characters	(blank)		
	Device Name	8 characters	(blank)		
A-22	Passcodes	- - -	- - -		
	Level 1	0000 to 9999	**0800**		
	Level 2	0000 to 9999	**0800**		
	Level 3	0000 to 9999	**0800**		
A-23	LCD Adjust	-9 to 0 to +9	**0**		
A-24	Config To Defaults	Exit to primary, Load Defaults	**Exit to Primary**		

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